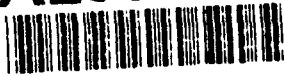


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DREDGING RESEARCH PROGRAM

TECHNICAL REPORT DRP-92-6

1

**US Army Corps
of Engineers**

**ADCIRC: An Advanced Three-Dimensional
Circulation Model for Shelves,
Coasts, and Estuaries**

Report 5

**A Tropical Storm Database for the East and
Gulf of Mexico Coasts of the United States**

by

Norman W. Scheffner, David J. Mark

DEPARTMENT OF THE ARMY

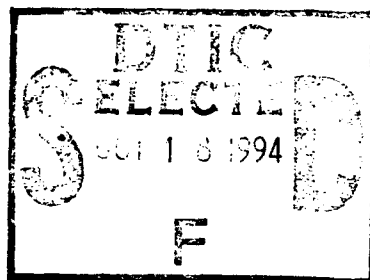
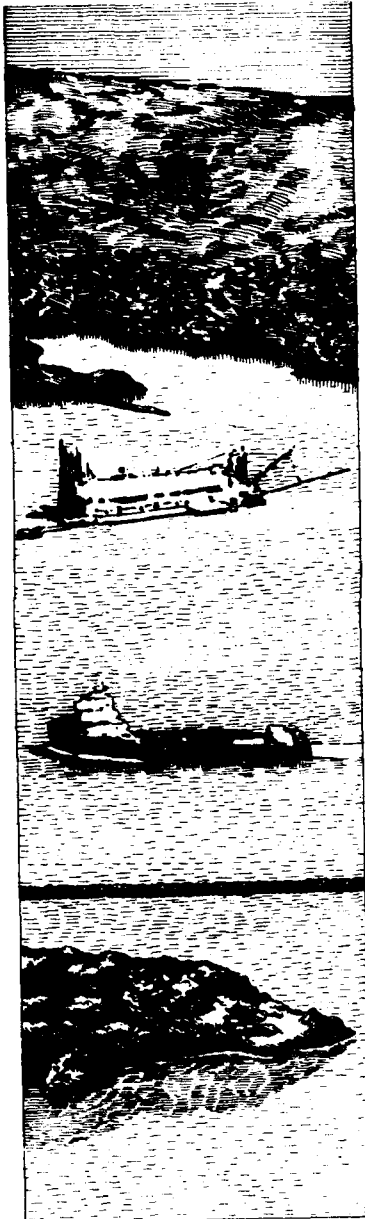
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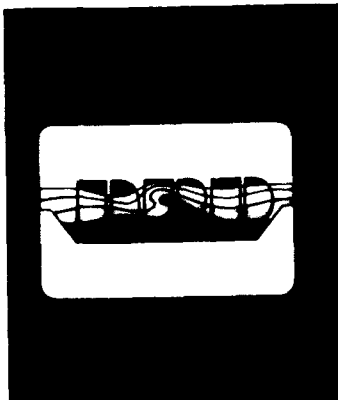
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Prepared for DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

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US Army Corps
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Dredging Research Program Report Summary



ADCIRC: An Advanced Three-Dimensional Circulation Model for Shelves, Coasts, and Estuaries; Report 5, A Tropical Storm Database for the East and Gulf of Mexico Coasts of the United States (TR DRP-92-6)

ISSUE: Dredged material disposal sites located in open water are classified as either dispersive or nondispersive depending on whether local water velocities are strong enough to erode and transport dredged material from the deposited mound. The Corps needs the capability to predict stability of the mound and long-term migration patterns of eroded material to (1) identify acceptable disposal site locations, and (2) provide a quantitative approach for gaining site designation approval.

RESEARCH: The overall work-unit objective is development of a systematic approach for predicting the dispersion characterization of a specific open-water disposal site. This objective includes the following goals:

- Identify realistic wind-, wave-, tide-, and storm-generated velocity boundary conditions.
- Develop numerical models capable of simulating dispersion characteristics of dredged-material mounds for periods of time in excess of 1 year.
- Provide site-designation technology to field engineers as a tool in site identification and designation.

This study reports the tropical storm database developed for locations along the east and gulf

coast of the United States, which is a part of the first two goals listed above.

SUMMARY: The numerical model ADCIRC-2DDI (a two-dimensional, depth-integrated, finite-element-based hydrodynamic circulation code) was applied to the western North Atlantic, Gulf of Mexico, and Caribbean Sea to develop a tropical storm database. This report presents initial results of the simulation of 134 historically based tropical storms and their maximum storm surge elevations at 486 locations along the east and Gulf of Mexico coasts of the United States. The availability of elevation and current hydrographs corresponding to each event and station is also described.

AVAILABILITY OF REPORT: The report is available on Interlibrary Loan Service from the U.S. Army Engineer Waterways Experiment Station (WES) Library, telephone (601) 634-2355. National Technical Information Service (NTIS) report numbers may also be requested from the WES librarians.

To purchase a copy call the NTIS at (703) 487-4650.

Authors and Advisors: Dr. J. J. Westerink and Mr. C. A. Hsiao are members of the Department of Civil Engineering and Geological Sciences of the University of Notre Dame; Dr. B. A. Lottich, Jr., the Institute of Marine Sciences, University of North Carolina at Chapel Hill; and Dr. Norman W. Scellinger and Mr. David J. Mark, the Coastal Engineering Research Center, WES. For further information about the DRP, contact Mr. B. Clarke McNair, Jr., Manager, DRP, at (601) 634-2070.

Point of Contact: Dr. Scellinger, Principal Investigator for work unit.

ADCIRC: An Advanced Three-Dimensional Circulation Model for Shelves, Coasts, and Estuaries

Report 5

A Tropical Storm Database for the East and Gulf of Mexico Coasts of the United States

by **Norman W. Scheffner, David J. Mark**

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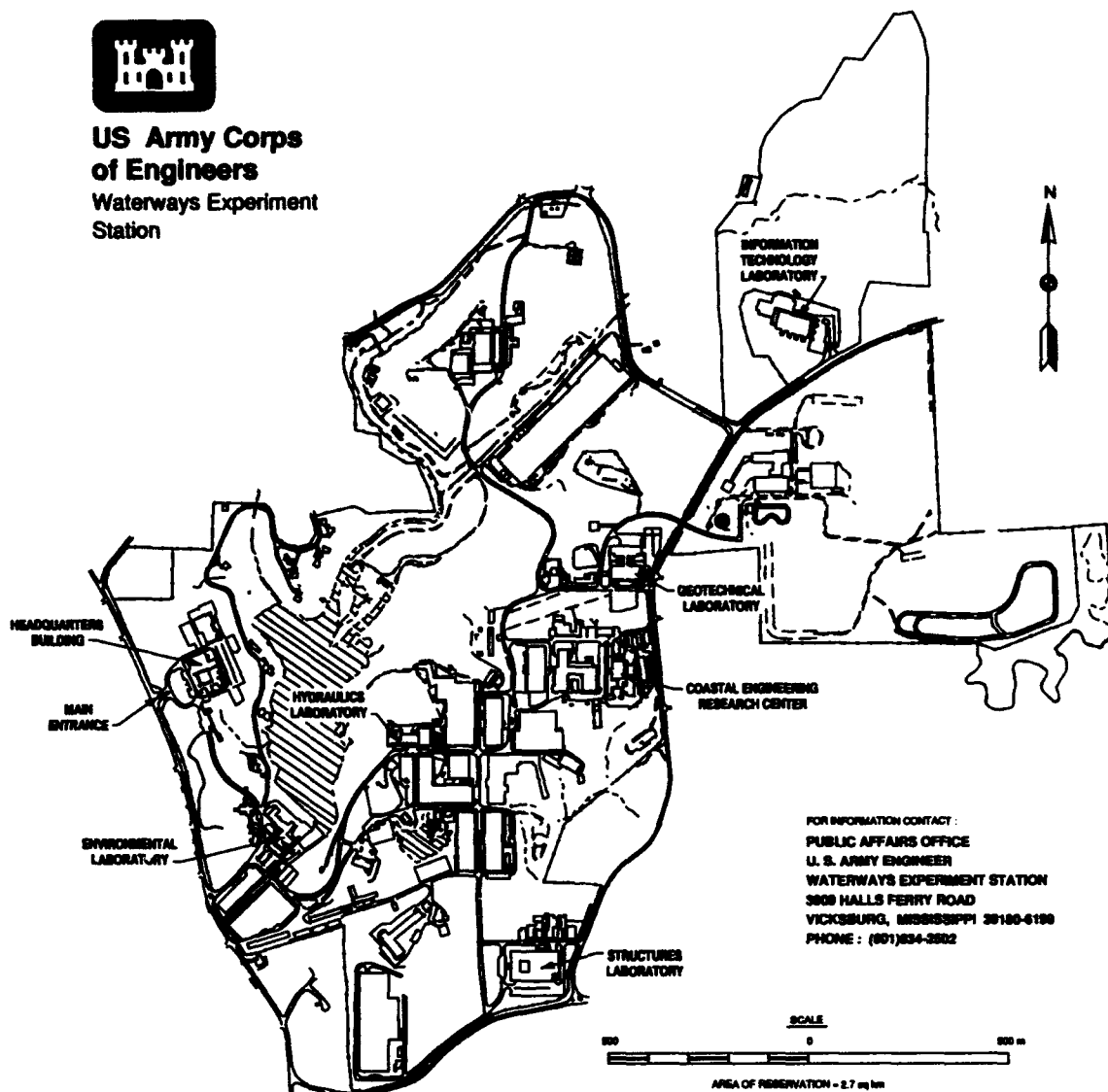
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Preface

The work described in this report was authorized and funded under Work Unit No. 32466, "Numerical Simulation Techniques for Evaluating Long-Term Fate and Stability of Dredged Material Disposed in Open Water," of Technical Area 1 (TA1), Analysis of Dredged Material Placed in Open Water, of the Dredging Research Program (DRP), sponsored by Headquarters, U.S. Army Corps of Engineers (HQUSACE). Messrs. Robert Campbell and Glenn Drummond were DRP Chief and TA1 Technical Monitor from HQUSACE, respectively. Mr. E. Clark McNair, Jr., Coastal Engineering Research Center (CERC), was DRP Program Manager (PM), and Dr. Lyndell Z. Hales was Assistant PM. Dr. Nicholas C. Kraus, Research Division (RD), CERC, was the Technical Manager of the DRP TA1, and Dr. Norman W. Scheffner, RD, CERC, was the Principal Investigator of Work Unit No. 32466. The numerical modeling goals, concepts and methodologies were developed by Drs. Norman W. Scheffner, Joannes J. Westerink, University of Notre Dame; and Richard A. Luetlich, Jr., University of North Carolina at Chapel Hill. Development and implementation of the hydrodynamic model were completed by Drs. Westerink and Luetlich. This report was written by Drs. Scheffner, Westerink, and Luetlich and Mr. David J. Mark, CERC, and Mr. C. A. Blain, University of Notre Dame.

This study was performed and the report prepared over the period 1 September 1992 through 1 April 1994. Dr. Scheffner was under the administrative supervision of Dr. James R. Houston, Director, CERC; Mr. Charles C. Calhoun, Jr., Assistant Director, CERC; and Mr. H. Lee Butler, Chief, RD, CERC.

At the time of publication of this report, Dr. Robert W. Whalin was Director of WES. COL Bruce K. Howard, EN, was Commander.

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Conversion Factors, Non-SI to SI Units of Measurement

Non-SI units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
degrees (angle)	0.01745329	radians
feet	0.3048	meters
knots (international)	0.5144444	meters per second
miles (U.S. statute)	1.609347	kilometers

Summary

This report summarizes results of a numerical storm surge study conducted for the east and Gulf of Mexico coasts of the United States. The report describes a database of surge elevations and currents produced from the numerical simulation of 134 historically based tropical storm events and their maximum water level surge impact at 486 discrete locations along the east and gulf coasts and Puerto Rico. A visual indication of the spatial distribution of peak surge elevation is provided in the form of an atlas of storm track and maximum storm surges corresponding to a 246-station nearshore subset of the 486-location database. The report contains cross-reference tables of stations impacted by each event and the events impacting each station. Included in the report are information on accessing the full 486-station computer database containing the surge elevation and current hydrograph for each storm event at each impacted location.

The hydrodynamic model selected for storm surge simulation is the ADCIRC-2DDI (ADvanced CIRCulation- 2-Dimensional, Depth-Integrated) model, which implements a finite element formulation of the depth-integrated conservation laws for mass and momentum. Storm surge elevations and velocities corresponding to each storm are computed over a very large domain encompassing the western North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. Previously, this domain was shown to accurately represent the peak storm surge as well as resonant modes associated with the storm surge response. Parameter specifications and details pertaining to boundary and internal forcings, ramp-up periods, time-step, and output format are included in this report. Computational requirements on a CRAY-YMP 6128 Computer for the average storm length of 11 days are 2.3 Central Processing Unit (CPU) hours.

The generation of data contained in the atlas is based on use of the National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center's HURricane DATa base (HURDAT), the Planetary Boundary Layer (PBL) hurricane model, and the ADCIRC long-wave hydrodynamic model. This report describes in detail these primary components of the study with an emphasis on the ADCIRC storm surge simulations.

Although this database was developed to provide input to a model that evaluates the long-term fate and stability of dredged material, the potential use

of such a database goes far beyond the testing of disposal site stability. The database described in this report can be used to provide offshore or nearshore boundary conditions for any type of coastal modeling or analysis requiring storm-generated elevation or current data, thus providing a benefit for all users requiring storm design criteria.

1 Introduction

Background

The goal of the "Numerical Simulation Techniques for Evaluating Long-Term Fate and Stability of Dredged Material Disposed in Open Water" work unit is to provide a simulation technique for determining how a specific dredged material mound behaves over time. The methodology is intended for site designation investigations and is based on coupled numerical model simulations using local hydrodynamic boundary condition input data. The intended use of the program is to provide a systematic and quantifiable approach to analyzing disposal site stability based on local environmental conditions.

If dredged material is eroded from a disposal site and transported beyond the limits of the designated site, the site is classified as dispersive; otherwise, it is nondispersive. For locations predominated by strong wave and current regimes, sediment transport calculations based on average wave and current data may easily show the site to be dispersive; however, if the local environmental conditions are not severe, material may either remain within the limits of the designated site or take months or years to be transported in significant amounts beyond the limits of the designated site. The ability to identify long-term dispersive sites is especially important since eroded material could be transported into environmentally sensitive areas. These long-term dispersion investigations cannot be accurately made without knowledge of the local wave climate and current conditions at the specific site.

Objective

The approach selected for disposal site analysis is a coupled hydrodynamic, sediment transport, and bathymetry change model driven by long-term local boundary condition input. These conditions represent those forcings that entrain and transport sediment. In the Dredging Research Program (DRP), short wind-driven waves, tidal elevations and currents, and storm-induced surge elevations and accompanying currents have been identified as the primary forcings of interest.

The Long Term FATE (LTFATE; Scheffner et al. 1994) disposal site analysis program is a series of coupled PC-based models available through the DRP and the Coastal Engineering Research Center (CERC). The LTFATE model is a coupled hydrodynamic, sediment transport, and bathymetry change model which predicts the long-term fate and stability of a dredged material disposal site as a function of local wave and current conditions. The procedures for generating stochastic wave height, period, and direction time series are reported in Borgman and Scheffner (1991). The database of tidal elevations and currents for the east coast, Gulf of Mexico, and Caribbean Sea are described in Westerink, Luettich, and Scheffner (1992). The objective of this report is to describe the development of and access to a database of tropical storm surge and current hydrographs for use as input to LTFATE for evaluating mound stability as a function of tropical storm events. Extratropical events will be treated in a follow-up report.

A database containing realistic approximations of the surge response to tropical events along the eastern U.S. and Gulf of Mexico coasts can be utilized for a wide range of problems other than the intended disposal site stability application. For example, seaside communities require estimates of potential storm surge heights for the development of strategies to eliminate or reduce the severity of coastal flooding and beach erosion caused by hurricane storm surges. Storm surge responses are incorporated into design criteria for offshore oil structures. In fact, many interests require storm surge elevation and current information to design and evaluate coastal protection measures. Estimates of these data are available through use of this database.

The unpredictable nature of tropical storms suggests that a storm surge database which approximates historically occurring events, incorporating such factors as the storm path, spatial extent, and intensity, would be an extremely useful design tool for evaluating various structural or nonstructural storm mitigation design alternatives. The implication of using this database is that extensive knowledge of the storm surge produced by past hurricanes can offer insight into storm surges which may be generated by some future event. Development of the database of surge elevations and currents necessarily begins with the simulation of numerous historically based events.

The work described herein is based on a series of simulations of 134 historically based hurricanes which have impacted the eastern and gulf coasts of the United States during the period from 1886 through 1989. The storm surge response for each storm is computed over a domain which includes the western North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. The hydrodynamic storm surge simulator is the finite-element-based model ADCIRC-2DDI (Luettich, Westerink, and Scheffner 1992; Westerink et al. 1992; Westerink et al. 1993a; Westerink, Luettich, and Scheffner 1993b). Storm surge elevations and velocities produced in this series of simulations are recorded at 486 coastal and near-coastal stations. The station elevation and velocity time series data generated by each storm comprise the tropical event database.

The sequence of tasks required to generate this database is as follows: (a) selection of historic events, (b) estimation of descriptive parameters corresponding to the historic events for input to a Planetary Boundary Layer (PBL) storm wind field model, (c) use of the wind field model to generate a temporal and spatial pressure and wind field distribution, and (d) use of that data as input to the large-scale hydrodynamic model ADCIRC to compute the spatial and temporal distribution of storm surge elevations and currents.

The steps described above are used to generate surge information using the 134 selected historical tropical storm events. Computed storm surge hydrographs were archived for 486 discrete locations for each simulation. Of the 486 station locations, 240 stations correspond to Wave Information Study (WIS) station locations (237 along the east and gulf coasts and 3 offshore of Puerto Rico), and 246 represent nearshore extensions of the WIS stations (237 along the east and gulf coasts with 9 located near Puerto Rico). This report summarizes the results of these simulations. Maps of the spatial distribution of the nearshore surge corresponding to each of the 134 events which impacted the coastline are provided in this report along with cross-reference tables showing stations impacted by each storm and storms which impact each station.

Because of the voluminous amounts of data involved with the generation of the database, computed storm responses have not been verified to prototype surge elevation data. This is due to the fact that the storm events were simulated without tides and are relative to mean sea level (msl) (therefore, peak values do not reflect the stage of the tide at the time of historical occurrence) and the fact that the hurricane parameters estimated from the HURDAT storm database are only approximate (i.e., all information necessary to numerically simulate each event is not known to a high degree of accuracy). Therefore, selected values have not been optimized by comparison of simulated results to prototype observations. For example, geostrophic wind speed and direction, radius to maximum wind, far field pressure, etc. are not known for each event and were estimated from available data. Because very few observations are available for events in the early 1900s, a consistent approach to parameter selection was developed. In defense of the above approximations is the intent of the database, i.e., to generate realistic tropical surge elevations and currents for use as boundary conditions for evaluating structural and nonstructural response to a variety of storm events.

The ADCIRC model has been rigorously verified for tidal and storm surge propagation. These efforts are described in the following sections. However, for this database, lack of verification of historical storm input parameters and their resulting wind and pressure fields may result in ADCIRC-computed surges which do not accurately reproduce historical surge measurements. Nevertheless, it is felt that the full storm database of events is representative of the range of historic events. Comparison of computed surge elevations to published observations of many simulated events, especially those that make land-fall, shows that the simulated events do give a reasonably accurate depiction of observed maximum values. Again, the purpose of this database and the descriptive summary atlas is not to provide hindcast data for historic storm surge

elevations because of the limitations described above; instead, it is to provide an approximation of the potential magnitudes and durations of storm surge which can occur along the east and gulf coasts of the United States as well as a realistic database of surge elevation and current hydrograph boundary conditions.

This report describes the primary components of the study--namely, the database of historically derived storm events and the assumptions made in their selection, the PBL hurricane wind-field model and its input, and the hydrodynamic model and its application to the generation of the database of tropical storm surge hydrographs. Finally, the contents of the database are described.

2 Study Components

HURDAT Database of Tropical Storm Events

The historic events used as the basis for all computations in this study were obtained from the HURDAT database developed by the National Oceanic and Atmospheric Administration's (NOAA) National Hurricane Center (NHC) (Jarvinen, Neumann, and Davis 1984). This database summarizes all hurricane and tropical storm events that occurred in the North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea and covers the 104-year period from 1886 through 1989.

Information contained in the HURDAT database includes latitude and longitude of the eye of the storm, central pressure in millibars (mb), and maximum wind speed in nautical miles per hour (knots) at 6-hr time intervals during the entire duration of each event. An example storm track is shown in Figure 1 for hurricane Bonnie, a relatively low-intensity event which impacted the gulf coast in June 1986. Table 1 shows the corresponding HURDAT Format information in which the date (month/year), north latitude ($\times 10$), west longitude ($\times 10$), and four values of maximum speed and central pressure corresponding to 0000, 0600, 1200, and 1800 Greenwich Mean Time (GMT) of the prescribed day are listed. In the example shown in Table 1, the storm begins at 1800 hr on 23 June 1986, with the eye of the hurricane located at 25.6 deg north latitude and 87.2 deg west longitude, a maximum wind speed of 25 knots,¹ and a central pressure of 1,014 mb. The 6-hr location, pressure, and maximum speed data are shown in the next 5 lines, the storm terminating on 28 June 1986 at 1200 hr with a speed of 10 knots and a central pressure of 1,012 mb.

A detailed description of the HURDAT data is provided by Jarvinen, Neuman, and Davis (1984). As stated above, some of the data contained in the HURDAT database for old storm events may not be as reliable as the more recent data; however, the data represent an extremely comprehensive database of historic events and is ideally suited to the goals of this project.

¹ A table of factors for converting non-SI units of measurement to SI units is presented on page ix.

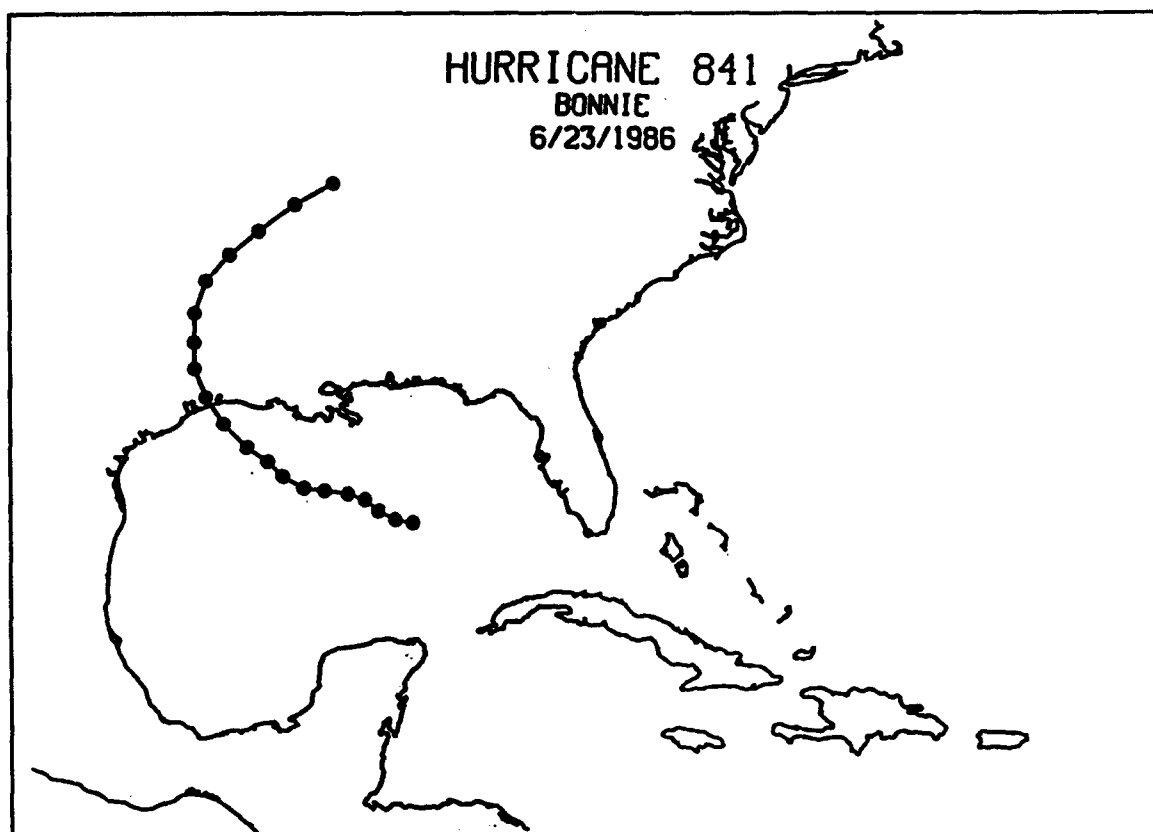


Figure 1. Hurricane track for Hurricane Bonnie

Table 1 HURDAT Data for Hurricane Bonnie									
86560	06/23/1986	M= 6	2	SNR= 841	BONNIE		XING=1	SSS=1	
86570	06/23*		*		*				*2560872 25 1014*
86580	06/24*2570878	25	1013*2600884	25	1014*2640889	30	1011*2660895	40	1006*
86590	06/25*2670903	45	1001*2680910	50	1002*2720917	55	997*2770922	65	1001*
86600	06/26*2820929	70	999*2900937	75	995*2990943	65	992*3090947	35	1000*
86610	06/27*3180947	30	1009*3280947	25	1015*3390943	20	1016*3480935	20	1016*
86620	06/28*3560925	15	1014*3650913	10	1013*3720900	10	1012*		*
86630	HR TX1								

The HURDAT database was used to provide input to the hurricane wind model in order to provide wind and pressure field input for the hydrodynamic model. A brief description of the wind-field model and its input requirements is given below.

PBL Hurricane Wind and Pressure Model

The PBL wind-field numerical model (Cardone, Greenwood, and Greenwood 1992) was selected for simulating hurricane-generated wind and atmospheric pressure fields. The PBL wind model determines wind speed by solving the equations of horizontal motion which have been vertically averaged through the depth of the planetary boundary layer. The model includes parameterization of the momentum, heat, and moisture fluxes together with surface drag and roughness formulations.

The well-known exponential pressure law is used to generate a circularly symmetric pressure field P_s centered at the low pressure eye of the storm:

$$P_s = P_{eye} + \Delta p e^{-(R/r)} \quad (1)$$

where

P_{eye} = pressure at the center or eye of the storm

$\Delta p = P - P_{eye}$, the pressure anomaly with P taken as an average background or far-field pressure

R = scale radius (often assumed equivalent to the radius to maximum wind)

r = radial distance outward from the eye of the storm.

The pressure field computed by the PBL model simulation is more conveniently expressed in terms of an equivalent height of water, $P_s/\rho_0 g$.

Wind speeds generated by the model are converted to surface wind stresses using a relationship proposed by Garratt (1977):

$$\frac{\tau_{s\phi}}{\rho_0} = C_D \frac{\rho_{air}}{\rho_0} |W| W_\phi \quad (2)$$

and

$$\frac{\tau_{s\lambda}}{\rho_0} = C_D \frac{\rho_{air}}{\rho_0} |W| W_\lambda \quad (3)$$

where

$\tau_{s\phi}, \tau_{s\lambda}$ = wind stresses in the ϕ and λ directions, respectively

$\rho_{air}/\rho_0 = 0.001293$ the ratio of the air density to the average density of seawater

C_D = frictional drag coefficient computed as $0.001(0.75+0.67|W|)$ where $|W|$ is the magnitude of the wind velocity, and W_ϕ , W_λ are the components of the wind velocity vector in the ϕ and λ directions, respectively. For simulations presented in this report, all surface roughness parameters pertain to the open ocean.

The PBL model requires a series of input "snapshots" consisting of a set of meteorological parameters defining the storm at various stages in its development or at particular times during its life. These parameters include: latitude and longitude of the storm's eye; track direction and forward speed measured at the eye; radius to maximum winds; central and peripheral atmospheric pressures; and an estimate of the geostrophic wind speed and direction. Radius to maximum winds is approximated using a nomograph that incorporates the maximum wind speed and the atmospheric pressure anomaly (Jelesnianski and Taylor 1973). All of these snapshot parameters were computed for each 6-hr storm location contained in the HURDAT tape.

The PBL model also requires a "histogram" file containing the hourly location of the eye of the storm. These data, as well as all pertinent storm parameters (i.e., forward speed, central pressure, direction, etc.), were computed for each hour from the 6-hr data in the HURDAT database via a cubic spline interpolation. Peripheral atmospheric pressures were assumed to be equal to 1,013 mb, and the geostrophic wind speeds were specified as 6 knots and having the same direction as the storm track.

The PBL model computes a stationary wind and pressure field distribution corresponding to each of the 6-hr snapshots on a nested grid composed of five subgrids. Each subgrid measures 21 by 21 nodes in the x- and y-directions, respectively, and the centers of all subgrids are defined at the eye of the hurricane. Although the number of nodes composing each subgrid is the same, the spatial resolution is doubled for each successive grid. For this study, the center grid with the finest resolution had an Δx and Δy grid spacing of 5 km. Incremental distances for the remaining subgrids were 10, 20, 40, and 80 km. These fixed grids translate with the propagating storm.

The hurricane translational or forward motion is incorporated into model calculations by adding the forward and rotational velocity vector components. A nonlinear blending algorithm is then incorporated to generate a nested grid field of wind and pressure for each hour during the life of the storm event. The location of each grid field corresponds to the location of the storm eye contained in the histogram file described above. These hourly wind and pressure fields are then interpolated from the PBL nested grid onto the hydrodynamic grid and subsequently stored for use by the ADCIRC model described in the following section.

Careful consideration must be given to the specification of meteorological forcing for each simulated storm event. Because wind stress and pressure gradients drive the numerical storm surge model, surge computations are limited by the accuracy of the specified wind stress and pressure fields (Hubbert, Leslie, and Manton 1990; Dendrou, Moore, and Myers 1985; Flather 1984). The PBL model utilizes meteorological data corresponding to historical storms to compute the associated wind stress and pressure forcing. As previously stated, data for all storm parameters, i.e., radius to maximum, geostrophic wind field, far-field pressure, etc., are not readily available and must be approximated.

These approximations may deviate somewhat from the conditions which occurred during the actual storm event. Therefore, the wind and pressure fields and resulting surge computations may not be precisely equivalent to observed conditions; however, their values will most likely not be in error by a substantial amount. Although this historically based simulation procedure should not be considered as a hindcast for the reasons presented above, the simulations are physically based and offer a more realistic representation of the meteorological forcing and response than empirically based simulations such as the Standard Project Hurricane model (Cialone 1991) used by Westerink et al. (1992) and other empirical models used by Johns et al. (1983), Flather (1984), Jarvinen and Lawrence (1985), and Hearn and Holloway (1990).

ADCIRC-2DDI Hydrodynamic Model

The finite-element-based hydrodynamic model ADCIRC-2DDI (Luettich, Westerink, and Scheffner 1992) was used for all storm event simulations. The model is the depth-integrated option of a system of two- and three-dimensional hydrodynamic codes (Luettich, Westerink, and Scheffner 1992; Westerink et al. 1992b). The model uses depth-integrated equations of mass, in the form of the generalized wave-continuity equation (GWCE), and momentum conservation, subject to incompressibility, Boussinesq, and hydrostatic pressure approximations. Using the standard quadratic parameterization for bottom stress and neglecting baroclinic terms and lateral diffusion/dispersion effects, the following set of conservation statements in primitive, nonconservative form expressed in a spherical coordinate system is incorporated in the model (Flather 1988; Kolar et al. 1993b):

$$\frac{\partial \zeta}{\partial t} + \frac{1}{R \cos \phi} \left[\frac{\partial UH}{\partial \lambda} + \frac{\partial (UV \cos \phi)}{\partial \phi} \right] \quad (4)$$

$$\frac{\partial U}{\partial t} + \frac{1}{r \cos \phi} U \frac{\partial U}{\partial \lambda} + \frac{1}{R} V \frac{\partial U}{\partial \phi} - \left[\frac{\tan \phi}{R} U + f \right] V =$$

$$\begin{aligned}
& -\frac{1}{R \cos \phi} \frac{\partial}{\partial \lambda} \left[\frac{p_s}{\rho_0} + g(\zeta - \eta) \right] + \frac{\tau_{s\lambda}}{\rho_0 H} - \tau_* U \\
& \frac{\partial V}{\partial t} + \frac{1}{r \cos \phi} U \frac{\partial V}{\partial \lambda} + \frac{1}{R} V \frac{\partial V}{\partial \phi} - \left[\frac{\tan \phi}{R} U + f \right] U = \\
& -\frac{1}{R} \frac{\partial}{\partial \phi} \left[\frac{p_s}{\rho_0} + g(\zeta - \eta) \right] + \frac{\tau_{s\phi}}{\rho_0 H} - \tau_* V
\end{aligned} \tag{5}$$

where

- t = time
- λ and ϕ = degrees longitude (east of Greenwich is taken positive) and degrees latitude (north of the equator is taken positive)
- ζ = free-surface elevation relative to the geoid
- U and V = depth-averaged horizontal velocities
- R = radius of the earth
- H = $\zeta + h$ is the total water column depth
- h = bathymetric depth relative to the geoid
- f = $2\Omega \sin \phi$
- ϕ = Coriolis parameter
- Ω = angular speed of the earth
- p_s = atmospheric pressure at the free surface
- g = acceleration due to gravity
- η = effective Newtonian equilibrium tide potential
- ρ_0 = reference density of water
- $\tau_{s\lambda}, \tau_{s\phi}$ = applied free surface stress
- τ_* = $C_f(U^2 + V^2)^{1/2} / H$ where C_f equals the bottom friction coefficient

The above governing equations for the model are based on spherical coordinate balance equations which have been transformed using a Carte Parallélogrammatique Projection (CPP) (Pearson 1990). The accuracy of these equations in solving various shallow-water problems is well-documented (Walters 1988; Werner and Lynch 1989; Walters and Werner 1989; Gray 1989; Foreman 1988; Lynch et al. 1988; Lynch and Werner 1991; Luetich, Westerink, and Scheffner 1992; Westerink et al. 1992, 1993b, c).

Model Verification

Although the ADCIRC model results were not verified for each individual storm event of the 134-storm input data set, the model has been thoroughly verified to both tidal forcing and storm surge propagation. This section briefly summarizes the verification efforts which have been undertaken to demonstrate and document the ability of the model to accurately simulate the propagation of long waves.

Prior to verification of the model to physical domain flow systems, a considerable amount of effort was expended to demonstrate the model's ability to correctly reproduce long-wave hydrodynamics by comparing model simulations to analytical results for idealized flow regimes. Quarter annulus tests as well as slosh tests conducted in a grid representation of a rectangular channel were performed. Results of these tests demonstrated the high degree of accuracy of the model, showed that there was negligible numerical damping in the solutions, showed that spurious-node solutions were not generated by the model, and finally demonstrated that waves with a wavelength of $2 \Delta x$ were accurately propagated through the computational grid.

Following the initial idealized case model tests, a benchmark application of the model was made to tidal flow through the English Channel. The computational grid consisted of 1,613 elements and 911 nodes. In this application, an 11-constituent tidal elevation time series boundary condition was used to drive the model. A 190-day simulation resulted in a successful verification of the model to 11 surface elevation stations and 8 velocity stations. Prototype data used for verification was the North Sea Benchmark data set. Details of both the initial model tests and the benchmark test are reported in Luetlich, Westerink, and Scheffner (1992).

A proof of concept application of the model was made to demonstrate the premise that the model could accurately reproduce tide and storm propagation over large domains. The pilot study for this concept was tested for the entire Gulf of Mexico. In this initial study, a three-tier verification of the model was completed. These phases included: (1) tidal elevation verification over the entire Gulf, (2) Mobile Bay tidal current verification, and finally (3) Panama City, FL, hurricane storm surge propagation verification to Hurricane Kate.

The computational grid used for the study is shown in Figure 2. The grid contains 3,939 nodes and 6,807 elements and demonstrates the flexibility of an unstructured grid by showing a ratio of maximum element area to minimum area greater than 15,000. This large ratio results from high grid resolution along the continental shelf in the vicinity of Mobile Bay and Panama City and low resolution in the deep portions of the gulf.

The tidal verification of the model was based on a five-constituent tidal time series (O_1 , K_1 , P_1 , M_2 , and S_2) boundary condition imposed at the Yucatan Channel and Strait of Florida, as shown in Figure 3. Tidal potential forcing, with a theoretical Earth tide potential reduction factor of 0.69, was

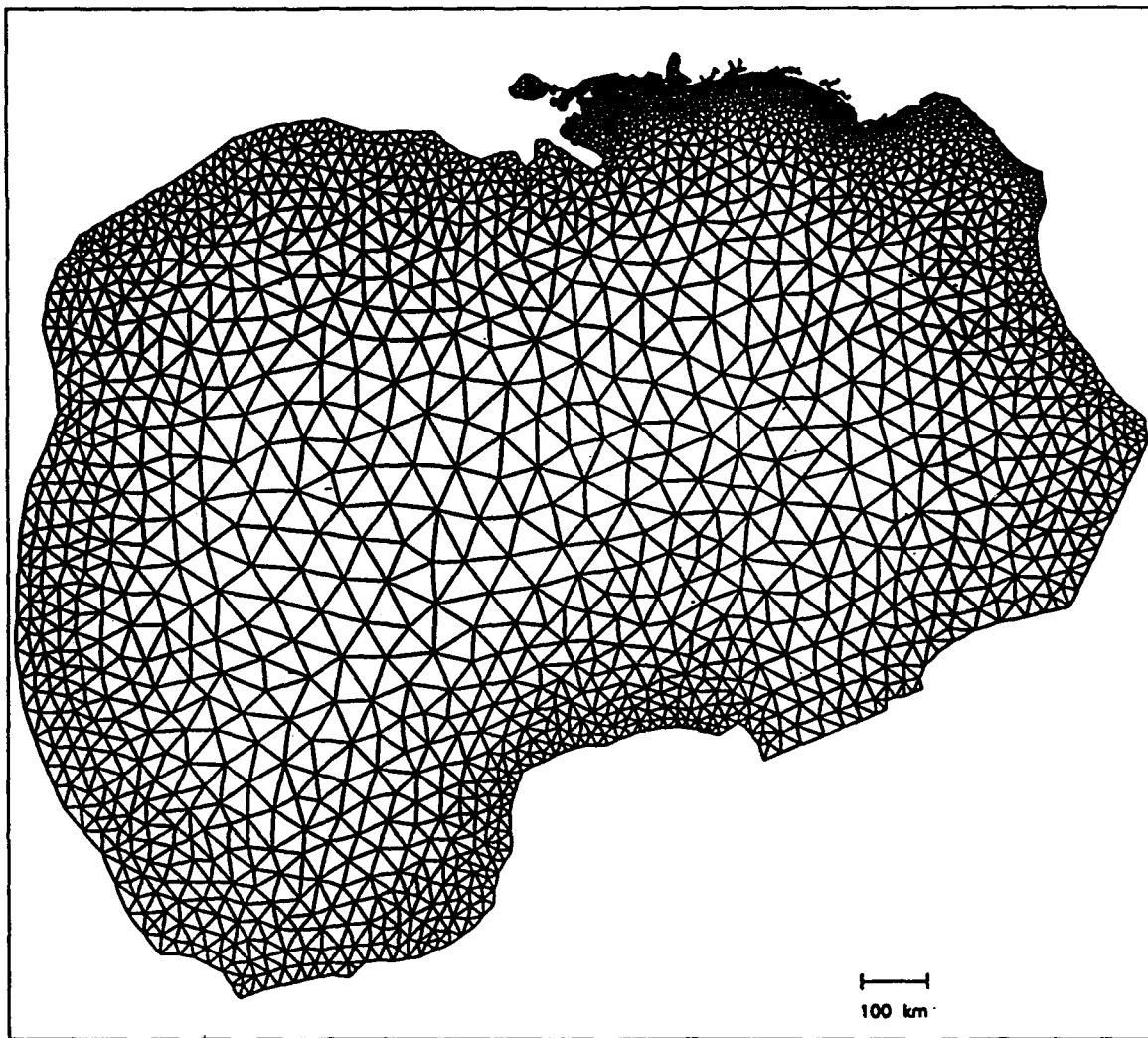


Figure 2. Gulf of Mexico computational grid

used for all simulations. Tidal comparisons were made at 20 elevation stations (shown in Figure 3), with results published by Reid and Whitaker (1981) and 20 tidal current stations located in Mississippi Sound (shown in Figure 4) reported by Outlaw (1983). Once grid resolution had been optimized for long wave propagation, tidal simulations were performed with no additional calibrations.

Therefore, the simulations of the study were entirely predictive and were highly successful at reproducing tidal elevations and currents throughout the domain. Typical comparisons for elevation and current are shown in Figures 5 and 6. Detailed comparisons of additional time series are given in Westerink et al. (1993a).

Verification of the model to tropical storm surge was made by simulating the propagation of Hurricane Kate, which made landfall in the vicinity of

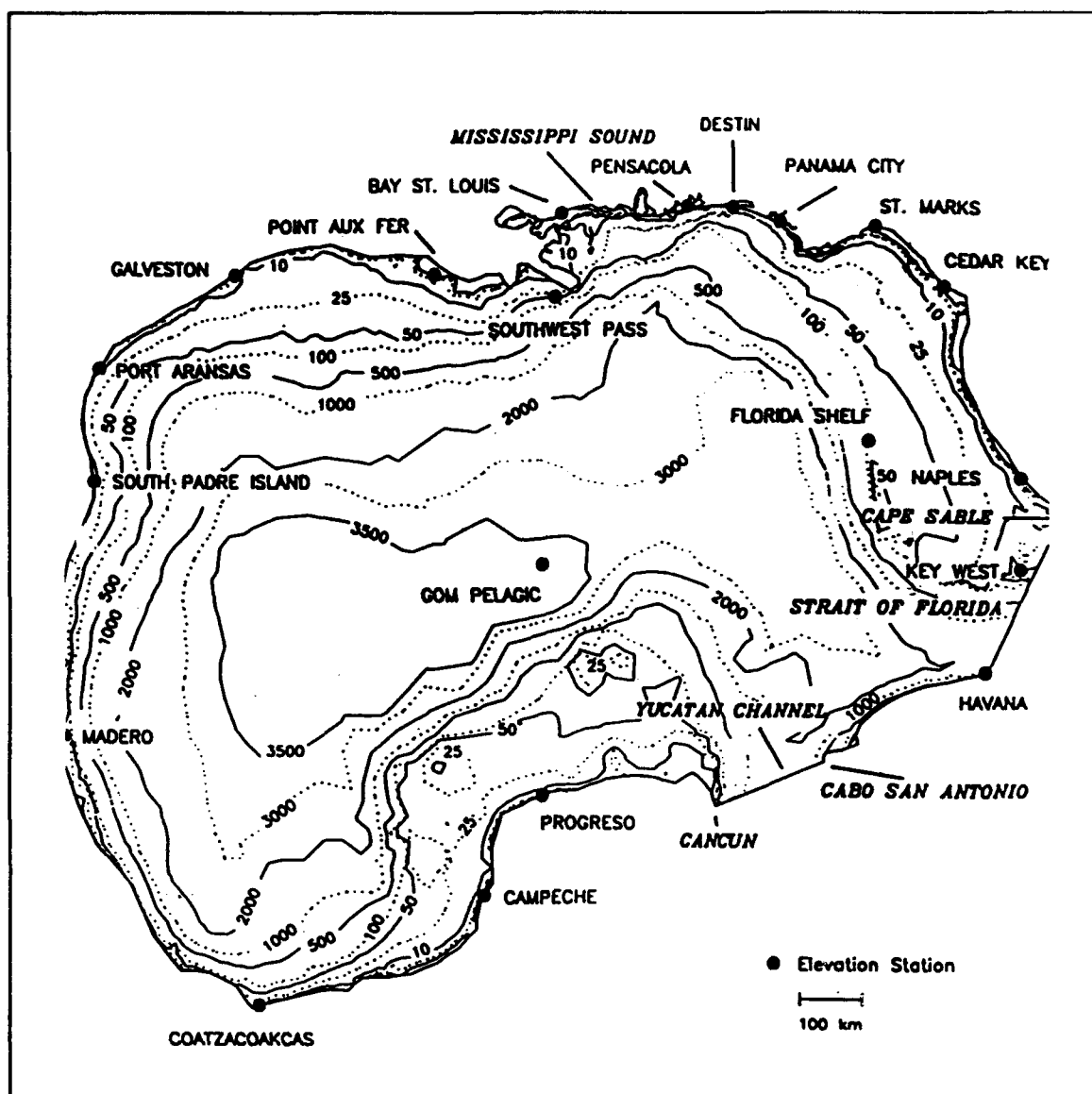


Figure 3. Gulf of Mexico tidal elevation stations

Panama City, FL (Figure 7), in November 1985. Wind and pressure fields were generated for input to ADCIRC through application of the Standard Project Hurricane (SPH) model (Cialone 1991). The PBL model described above has since replaced the SPH model as the model of choice. Comparisons of model-to-prototype surge elevations are shown in Figure 8 for two stations located to the east of landfall. In both cases, the model was able to reproduce the storm surge with a reasonable degree of accuracy.

A large-domain ADCIRC application to storm surge propagation was made for a study that examined storm surge versus frequency of occurrence along the coast of Delaware. This study involved verification of the model to a combination of tide and storm surge. Some of the inadequacies of the SPH

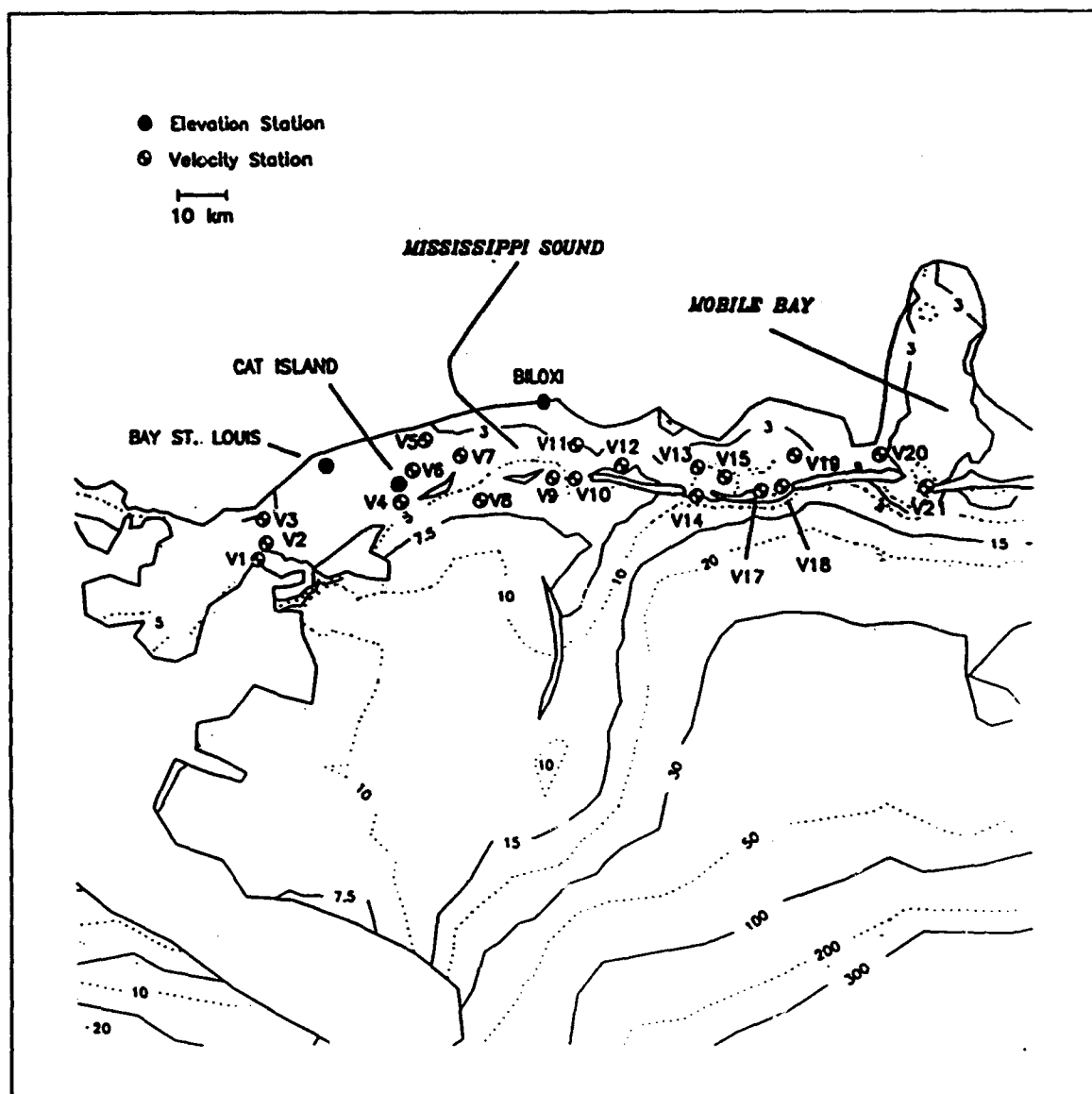
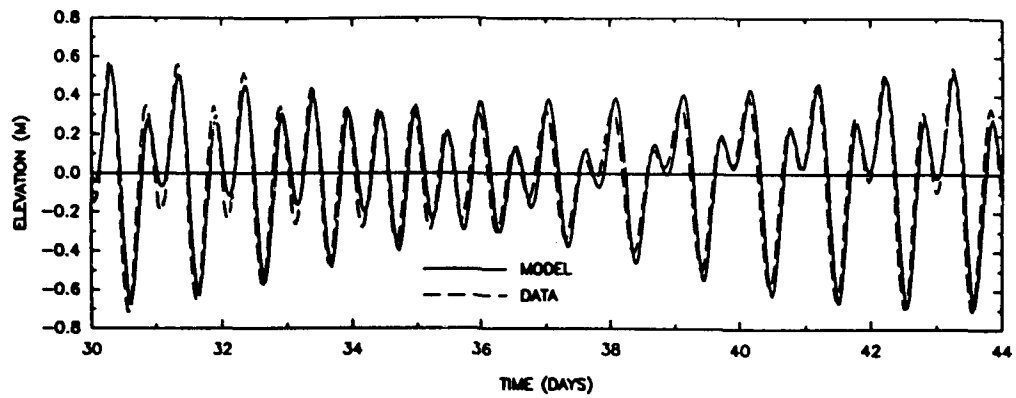
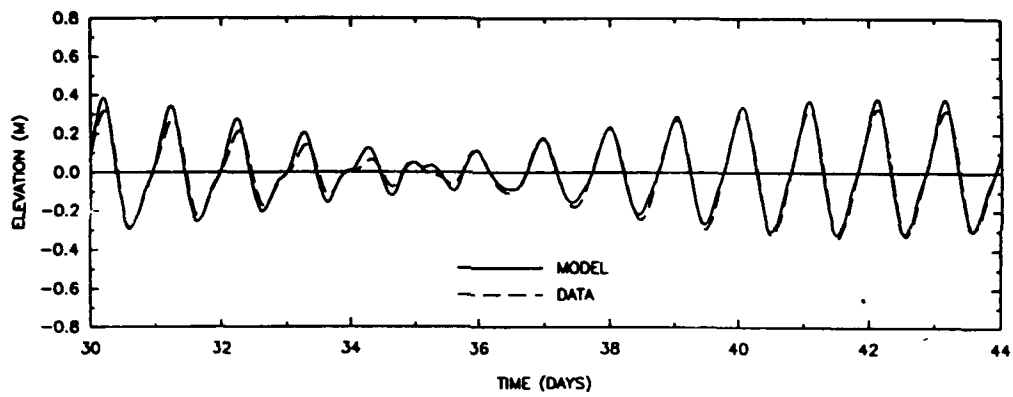


Figure 4. Mississippi Sound tidal current stations

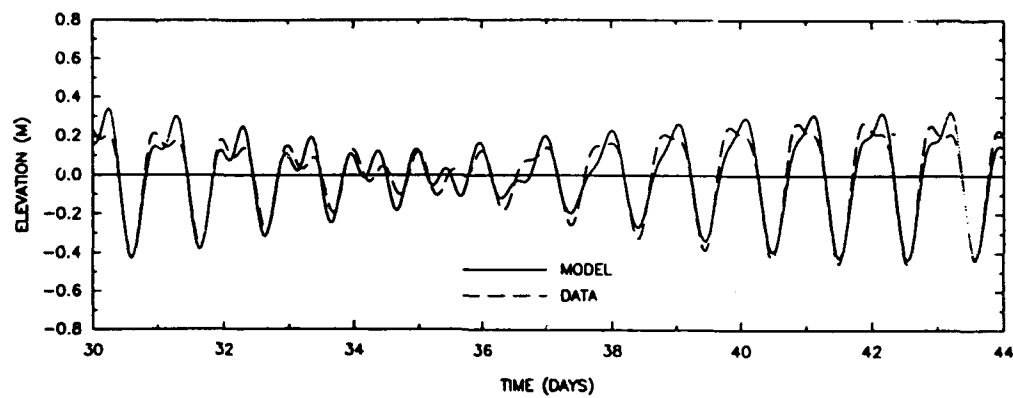
model noted in the Panama City study were rectified by selection of the PBL model over the SPH model. In fact, this study represented the pilot application of the combined PBL and ADCIRC modeling approach to simulate the propagation of storm events over very large computational domains. Details of the study are presented in Mark and Scheffner (1993). Accuracy achieved with the model can be seen in the model-to-prototype comparison for Hurricane Gloria shown in Figure 9. As evidenced in the figure, the comparison is excellent and it initiated generation of the full tropical storm database described in the following sections.



a. St. Marks Light, FL

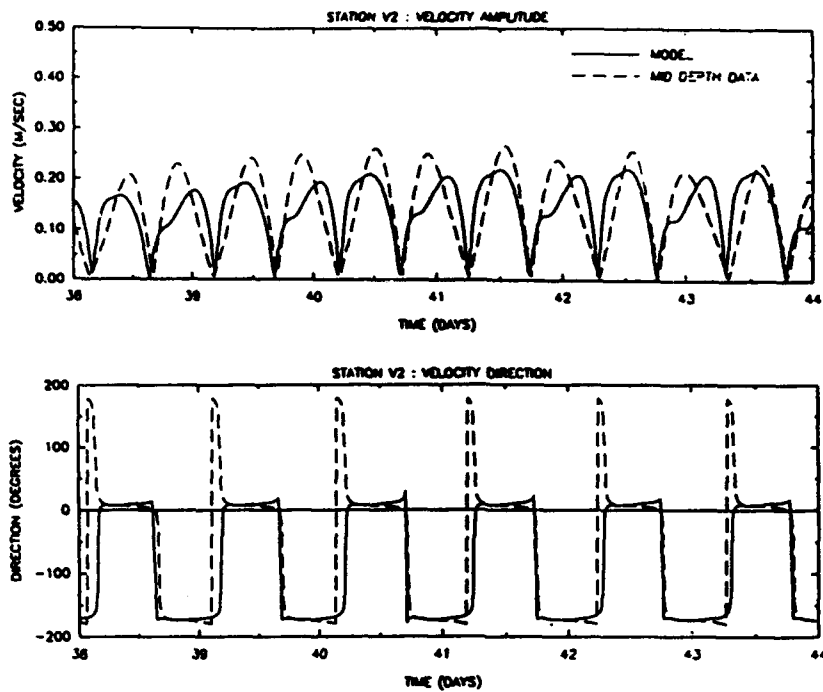


b. Cat Island, MS

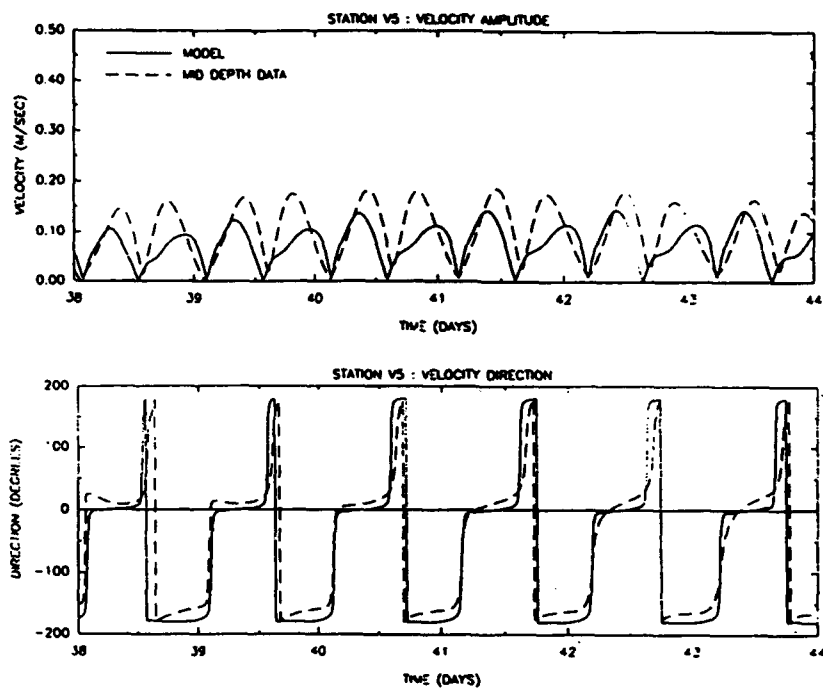


c. Point au Fer, LA

Figure 5. Typical tidal elevation comparisons



a. Station V2



b. Station V5

Figure 6. Typical tidal current comparisons

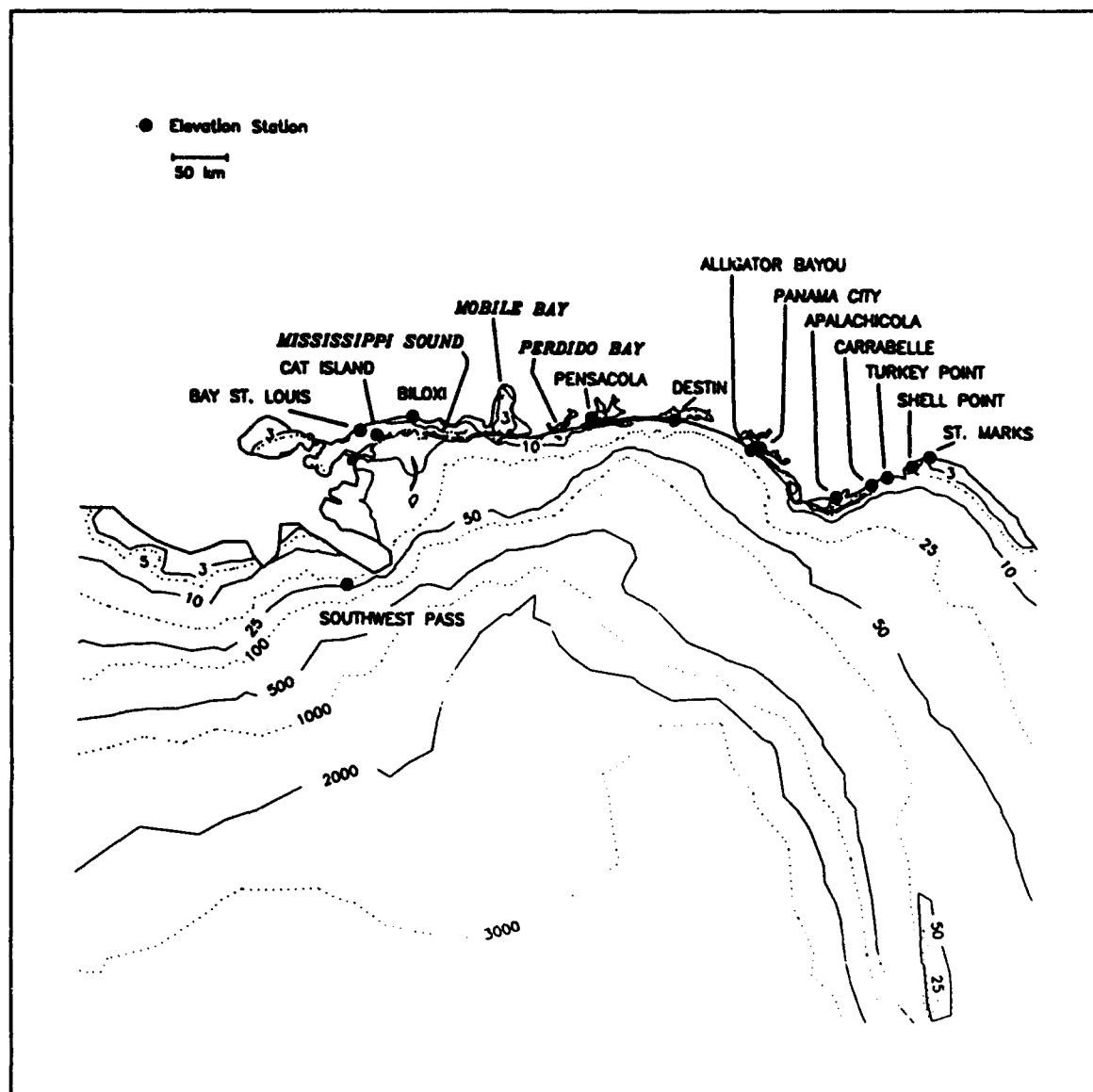


Figure 7. Coastline in the vicinity of Panama City, FL

Simulation Modifications

Two modifications to the standard governing equations and boundary conditions specification were made for the surge computations. First, an inverted barometer effect was specified at the open-ocean boundary to partially account for meteorological forcing there. The inverted barometer effect $P_s/\rho_0 g$ is defined as the height to which the sea water will rise due to static pressure forcing. Second, the convective and finite amplitude terms were not included in the governing equations for these simulations due to instabilities caused by near-drying elements as the storm moves onshore and winds are directed offshore. Consequently, the only nonlinear term included in the governing

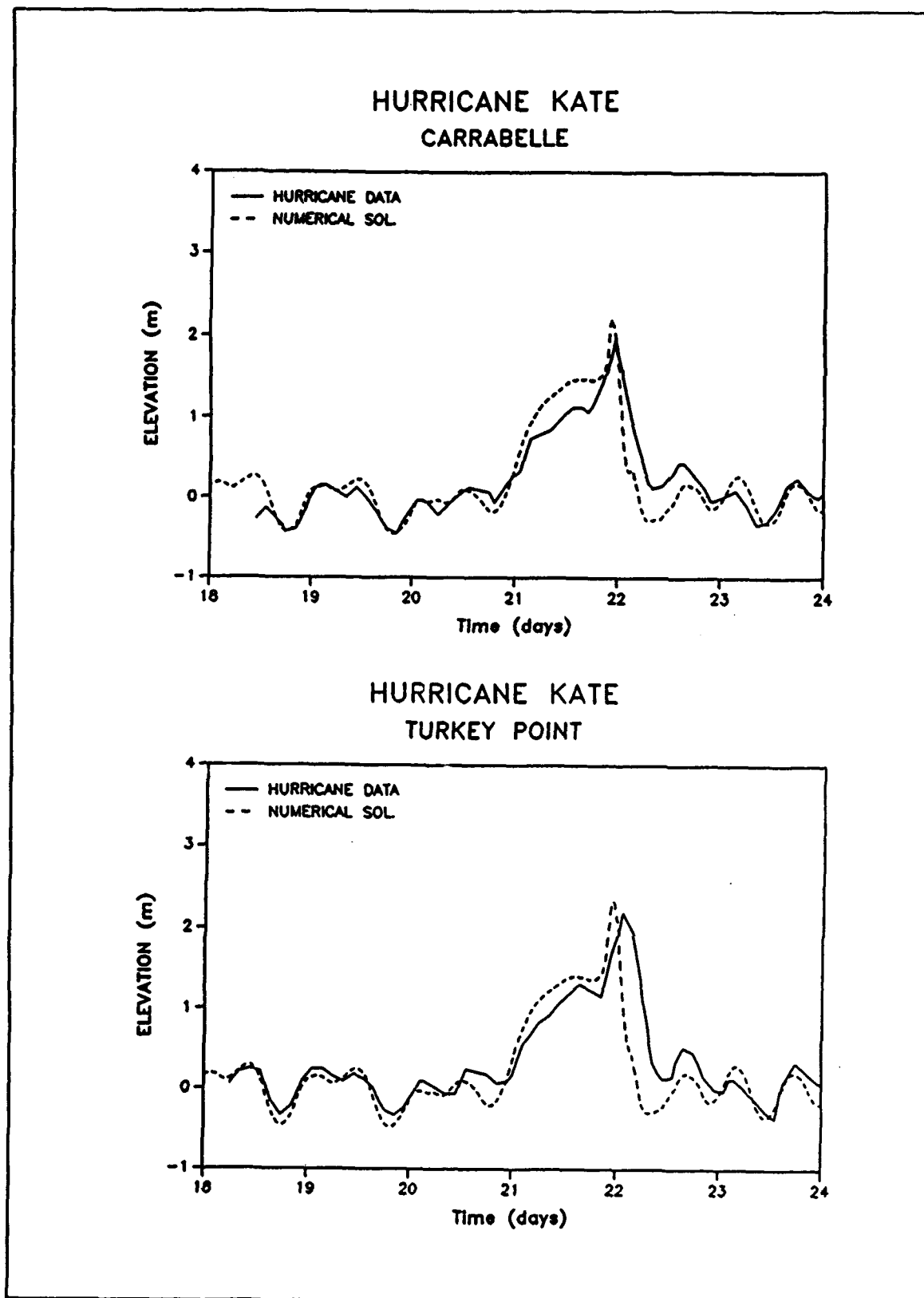


Figure 8. Model-to-prototype surge comparisons for Hurricane Kate

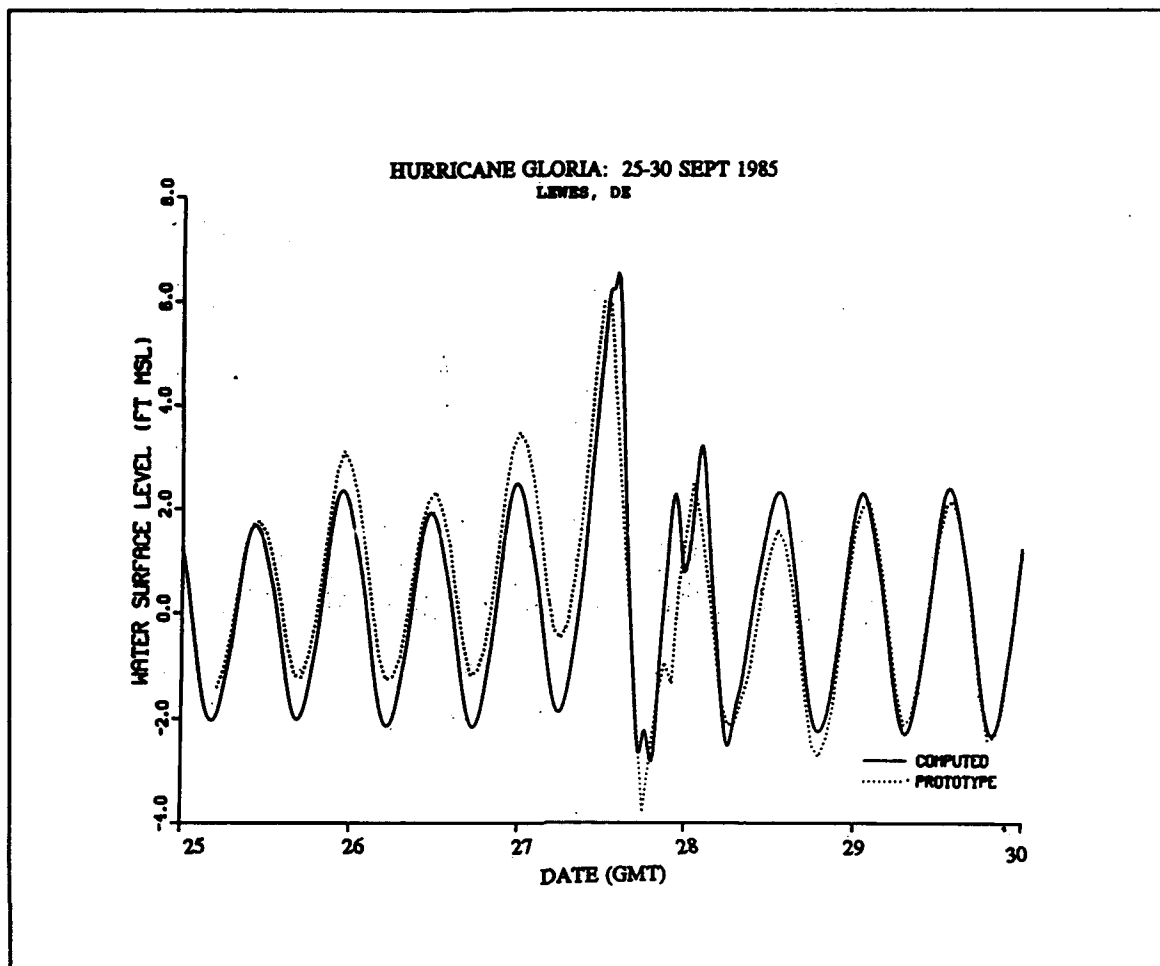


Figure 9. Comparison of model-to-prototype observations for Hurricane Gloria

equations is bottom friction. The bottom friction coefficient is held constant and equal to 0.003 over the entire domain.

The Coriolis parameter spatially varies throughout the domain and is computed on a nodal basis. The GWCE parameter τ_0 , which represents the balance between the primitive continuity and wave equation portions of the GWCE, is set to 0.001 (Kolar et al. 1993a). A minimum depth of 3.0 m is also specified. Eddy viscosity is not included in model computations.

Simulations are spun up from static initial conditions using a 1-day ramp in time. Application of a hyperbolic ramp function reduces the excitation of nonphysical short wavelength frequencies. An identical 1-day ramp function is applied to the wind and pressure forcing as well as the inverted barometer boundary condition. Therefore, the total simulation time is equal to the length of the event (determined from the HURDAT database) plus the 1-day ramp-up period. If the storm event is outside the modeled domain, the wind and pressure fields imposed on the model are set to zero; however, ADCIRC computations are made with the null boundary conditions in order to preserve the event

timing with, and proper correlation to, the HURDAT data. During the first 6 hr preceding the simulation, the initial hurricane wind and pressure forcings are held stationary. Following this initial 6-hr period, storm surge predictions begin on the zero hour of the storm and continue through the final hour of the storm as indicated by the historical hurricane data. A time step of 45 sec is used throughout the simulation period. For these simulations, no calibration or tuning of parameters was performed for either the PBL model or the hydrodynamic model.

The finite element formulation used in the ADCIRC hydrodynamic model, with its inherent grid flexibility, facilitates the use of a large computational domain and is considered an ideal formulation for a storm surge model. Flexibility of the finite element method leads to easy incorporation of coastline detail and nodal densities which range from three to four orders of magnitude in spatial resolution. This wide variation in nodal density arises due to the hydrodynamic considerations of surge propagating from deep open water to the coast zone. These considerations require high grid resolution in shallow coastal areas, in regions of complex coastlines and/or bathymetric change, and in regions of significant storm surge caused by, for example, focusing effects and coarse discretizations in the deep ocean where processes occur gradually.

The efficiency of the finite element method leads to a discrete problem associated with a large domain that remains well within computational limits. Finite element equations generated within the ADCIRC model are solved using a preconditioned conjugate gradient iterative solver which further minimizes storage requirements. Specifics of the surge computations follow.

3 Storm Surge Computations

As mentioned earlier, the storm events comprising the tropical storm database were not rigorously verified to prototype measurements; rigorously comparing the output of 134 events to observed data at hundreds of locations was beyond the scope, in both time and cost, of this project. However, as described in the previous section, the ADCIRC-2DDI model has been well-verified to long wave propagation. These verification efforts extend from detailed tidal elevation and circulation applications to multiple tropical storm surge simulations. Therefore, although precise comparisons to existing data were not made, solutions can still be considered reasonably accurate because the model has been thoroughly verified for tide and storm surge propagation. Any discrepancies between model simulation and prototype observations are due to a lack of knowledge concerning the storm event descriptive parameters used as input to the PBL model. These uncertainties are usually not too severe, as was determined by numerous spot comparisons of model surge computations to maximum elevation prototype observations. However, exceptions occur which should be noted.

For example, a maximum storm surge (no tide) of 1.31 m was recorded at Lewes, DE, in the simulation of Hurricane Gloria described above. The post-hurricane memorandum (Jarvinen and Gebert 1986) reported that Hurricane Gloria had a radius to maximum of 20 statute miles when positioned approximately 40 statute miles offshore of the entrance to Delaware Bay. If a value of 20 statute miles is specified as input to the PBL model, the resulting wind and pressure fields produce an ADCIRC simulated maximum surge elevation of 1.37 m. The comparison shown in Figure 9 is based on this value. However, in the simulation of the 134-event database, radius to maximum values were based on the nomograph approximation for radius to maximum presented by Jelesnianski and Taylor (1973). This approximation produced a radius to maximum value in excess of 35 miles, approximately the same distance between the eye of the hurricane and Lewes, DE. As a result, the computed maximum surge along the coast is reported to be 3.3 m, approximately 2.5 times greater than observed. This discrepancy is due to the fact that the forward speed of Hurricane Gloria rapidly increased as the storm passed the coast, resulting in a lower radius to maximum than that obtained from the nomograph, which is based on normal conditions.

Inconsistencies of this type were not found to be common in the data and do not invalidate the intent or usefulness of the database. Their presence only demonstrates that accurate hindcasting of a particular event requires accurate specification of input storm event parameters. Verification of the computed storm surge must then be made to prototype data.

The following sections describe details which relate to the storm surge computations contained in the database. Initially, a description of the domain size over which computations proceed is given. The ADCIRC model parameter values and simulation specifications are then outlined. Finally, a description of the selection of coastal and offshore stations at which storm surge elevations and water velocities are recorded is included.

Domain Description

A very large computational domain, shown in Figure 10, is used for modeling the storm events selected as the basis for this database. The modeled area includes the western North Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea. This domain was initially developed for tidal propagation studies (Westerink et al. 1993b); however, its implementation for storm propagation has been demonstrated through accurate predictions of both the primary storm surge and the surge forerunner effect (Blain, Westerink, and Luetich 1993). The very large expanse of the adopted computational domain compares to an area on the order of 40 times the scale of an average hurricane.

The primary benefit of using this existing grid is that it permits a hurricane to progress through the domain, generating and propagating storm surge in a natural and realistic fashion. The inclusion of contiguous basins allows proper setup of basin resonant modes and facilitates the accurate propagation of storm surge throughout the domain onto the continental shelf, where development of the storm surge is most critical. Because the open boundaries lie within the deep Atlantic Ocean and are far removed from the intricate processes occurring in response to the storm on the continental shelf and within the Gulf of Mexico basin, errors introduced by near-storm computational boundaries are minimized. Thus, with a large domain, open ocean boundary conditions are simplified and basin-to-basin interactions, as well as basin resonant modes, are accurately represented.

The offshore boundary condition is represented by a single deep Atlantic Ocean boundary which extends from Glace Bay, Nova Scotia, to the vicinity of Corocora Island in eastern Venezuela approximately along 60 deg west longitude. All other boundaries are defined by the eastern coastlines of North, Central, and South America. Topography within the domain, depicted in Figure 11, includes the continental shelf whose depths range from an imposed minimum of between 3 and 7 m to 130 m at the shelf break; the continental slope, which has a typical depth range of 130 m to 3,000 m; and the

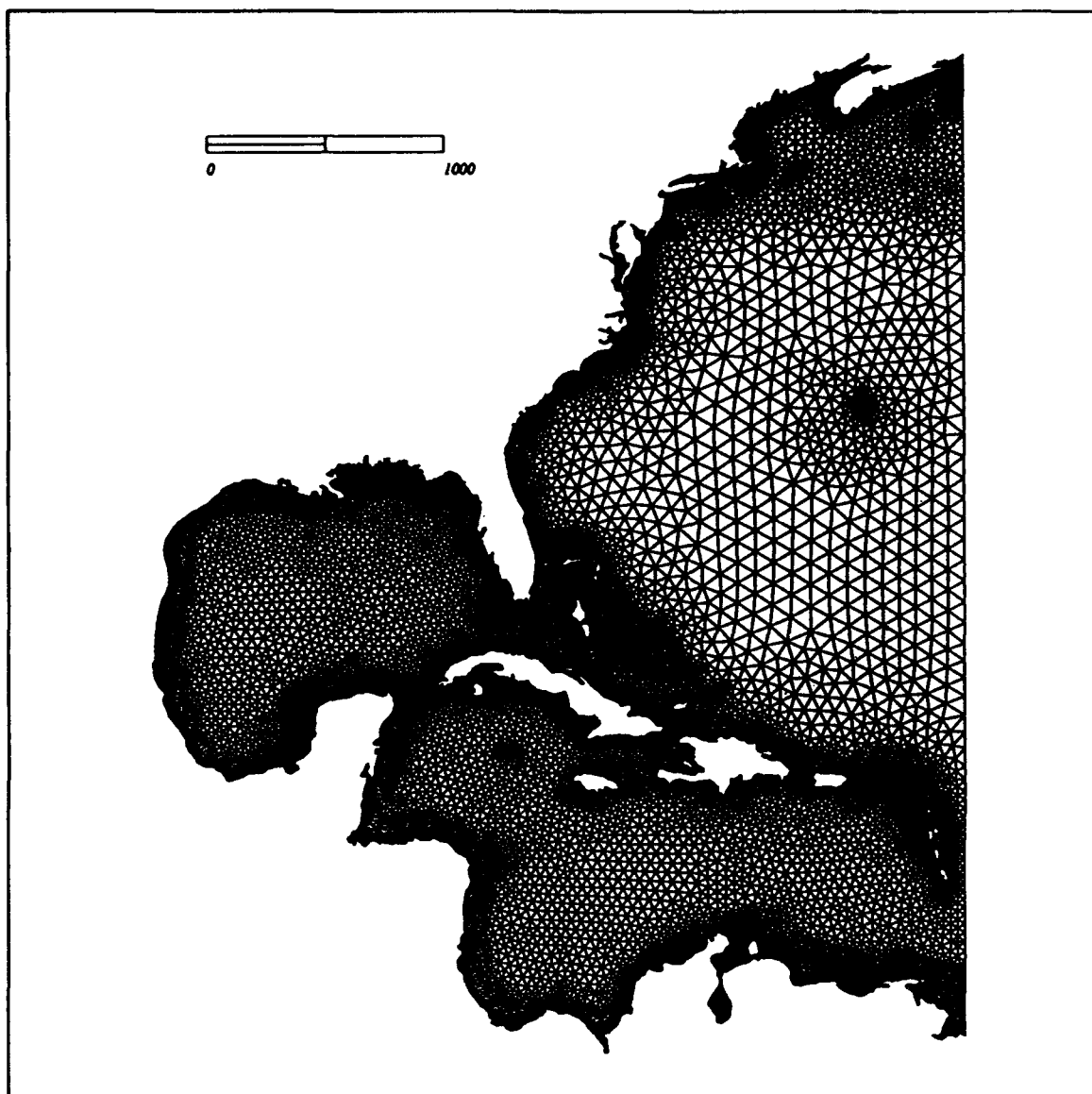


Figure 10. The east coast, Gulf of Mexico, and Caribbean Sea computational domain

continental rise and deep ocean, where depths increase upwards from 3,000 m to almost 8,000 m.

Bathymetry values are taken from the ETOPO5 database of the National Center for Atmospheric Research and, in regions along the Florida coast and shelf bathymetries, by the National Ocean and Atmospheric Administration Digital U. S. Coastal Hydrography sounding database (distributed by NOAA National Geophysical and Solar-Terrestrial Data Center in Boulder, CO). Discretization of the computational domain, shown in Figure 10, entails 22,711 nodes and 41,709 elements. Grid spacing has a wide variability within the computational domain. For example, the minimum node-to-node spacing is approximately 0.5 km along the Florida shoreline, while in the deep Atlantic

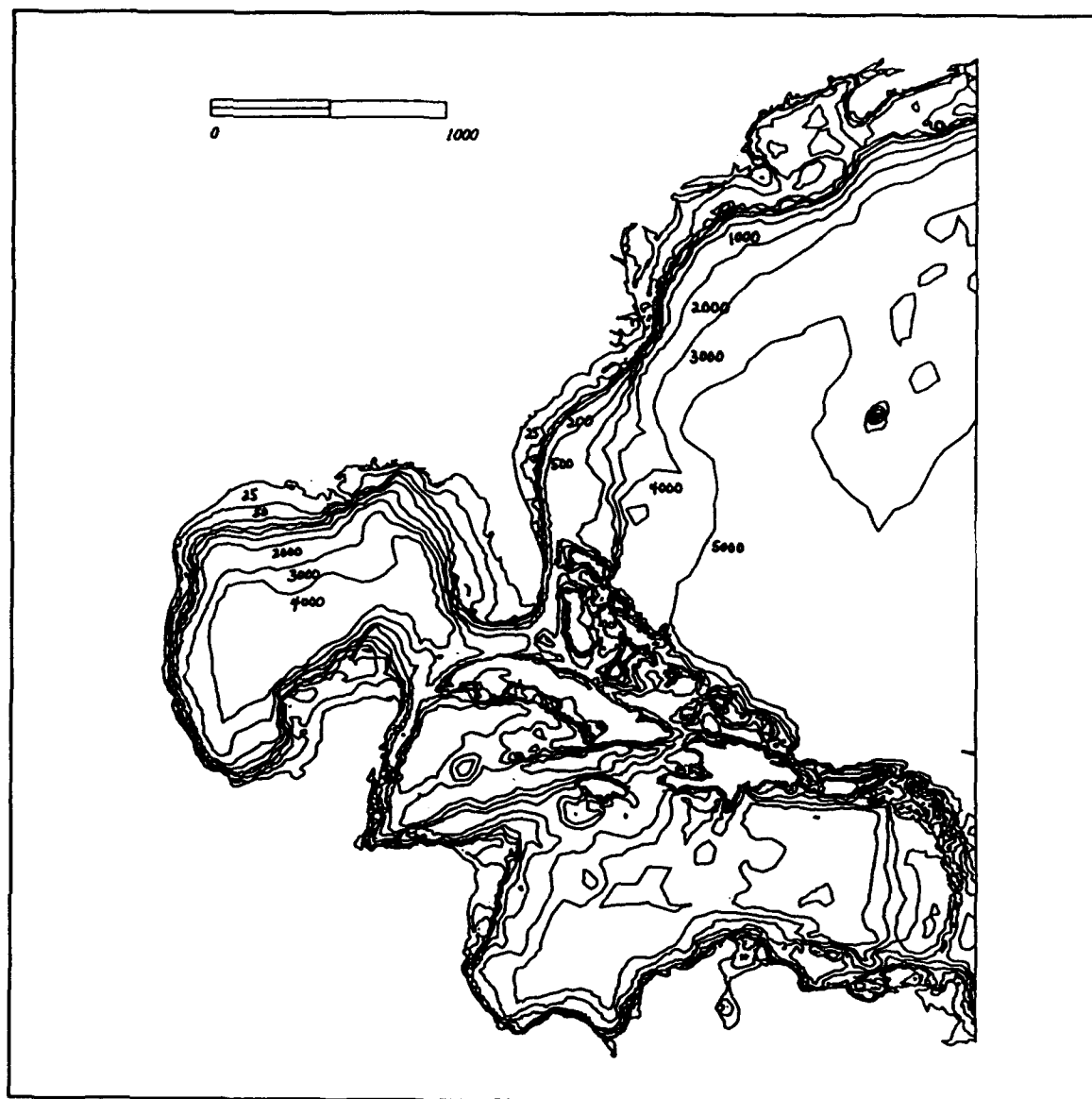


Figure 11. The computational domain and bathymetry contours in increments of 25, 50, 100, 200, 500, 1,000, 2,000, 3,000, 4,000, 5,000, and 8,000 m

ocean, spacing increases to about 105 km. Optimal gridding and the flexibility of the finite element method make a large computational domain manageable.

Storm Event Selection

The selection of events from the HURDAT data for the construction of this database was begun by partitioning the U.S. coastline into the eight coastal segments described by Ho et al. (1987). These segments are described in Table 2 and referenced to the locator map of Figure 12. Each of these regions

Table 2
Coastal Segments (after Ho et al. (1987))

Segment Number	Milepost Range	Description
1	0-400	Gulf coast from Mexican border to Galveston, TX
2	400-700	Gulf coast from Galveston, TX, to Mississippi Delta
3	700-1100	Gulf coast from Mississippi Delta to Suwannee Sound, FL
4	1100-1415	Gulf coast from Suwannee Sound, FL, to the southern tip of Florida Peninsula
5	1415-1800	Whole Atlantic Coast of Florida
6	1800-2200	Atlantic coast from Georgia to Cape Hatteras
7	2200-2700	Atlantic coast from Cape Hatteras to Rhode Island
8	2700-3100	Atlantic coast from Rhode Island to Canadian border

was defined to have a homogeneous population of events such that storm parameters associated with events for one location in the segment appear similar to the parameters associated with another location within the segment. A thorough analysis of the selection process and procedures is presented in Ho et al. (1987).

The initial selection of events was made by defining a latitude and longitude rectangle encompassing each of the eight regions. These regions are shown in Figure 13. The tracks of all 875 events in the 1886-1989 edition of the HURDAT file were examined to determine if they entered the segment rectangle. Of those that did enter the rectangle, events whose minimum central pressure was greater than 995 mb, whose track was only on the landward side of the rectangle, and whose location was far from the shoreline near the seaward boundary, were discarded. This process of elimination resulted in the selection of the following number of events associated with each rectangle: 1-27, 2-35, 3-29, 4-33, 5-55, 6-52, 7-30, and 8-21.

Because many of the events impacted two or more segments, there were numerous redundancies identified in the segment-by-segment selection of events. After removing duplications, 134 events were selected for use in the modeling simulation process. These selected events are listed in chronological order in Table 3 according to date of inception, corresponding HURDAT number, and given name.

The 134 storm events selected for this study were simulated via the HURDAT-based event parameter computation, the PBL model generation of wind and pressure fields over the computational grid, and the ADCIRC computation of storm surge surface elevation and current hydrographs. The selection of appropriate locations for archiving these time series data is described in the following section.

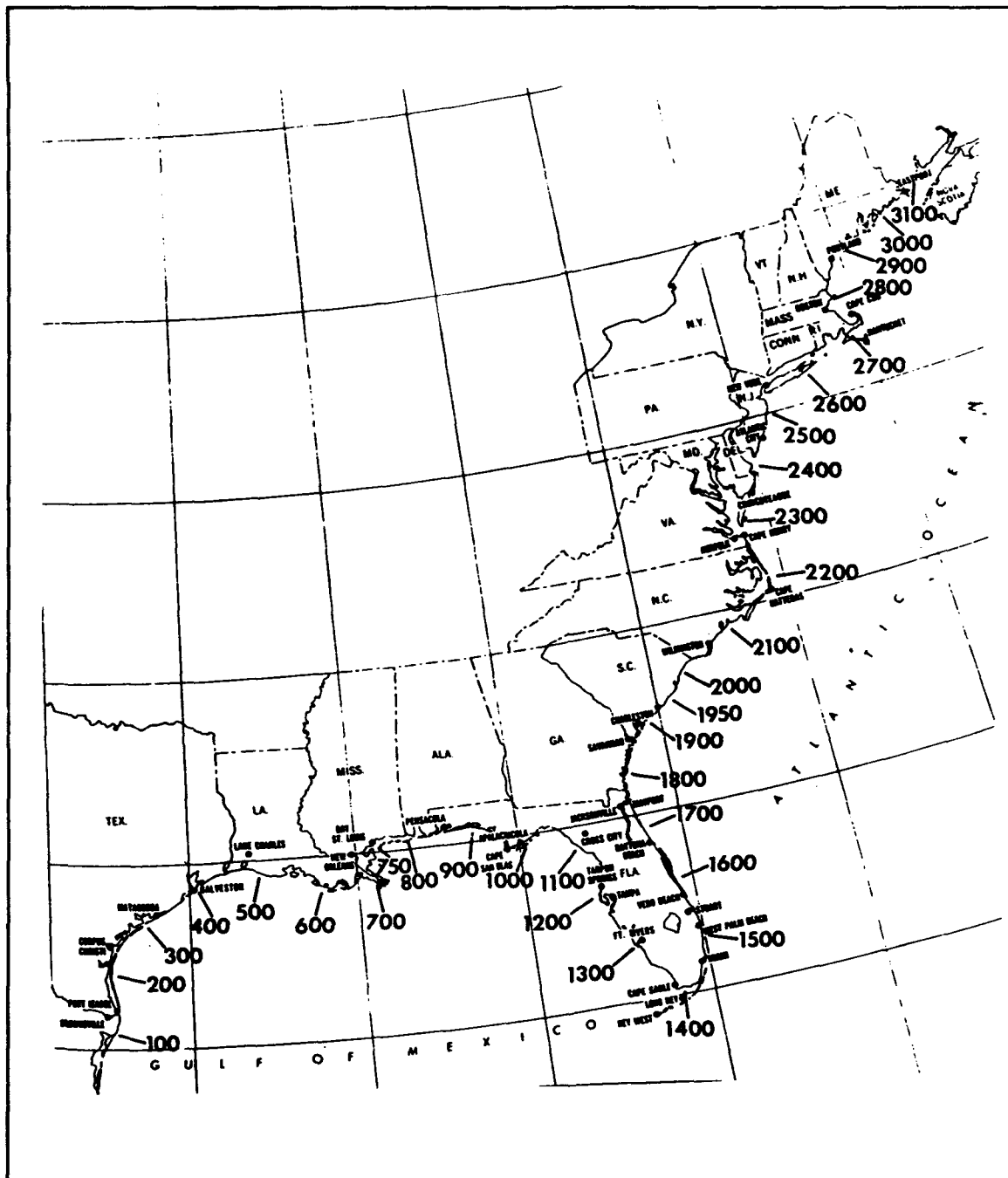


Figure 12. Locator map with coastal distance intervals in nautical miles (after Ho et al. (1987))

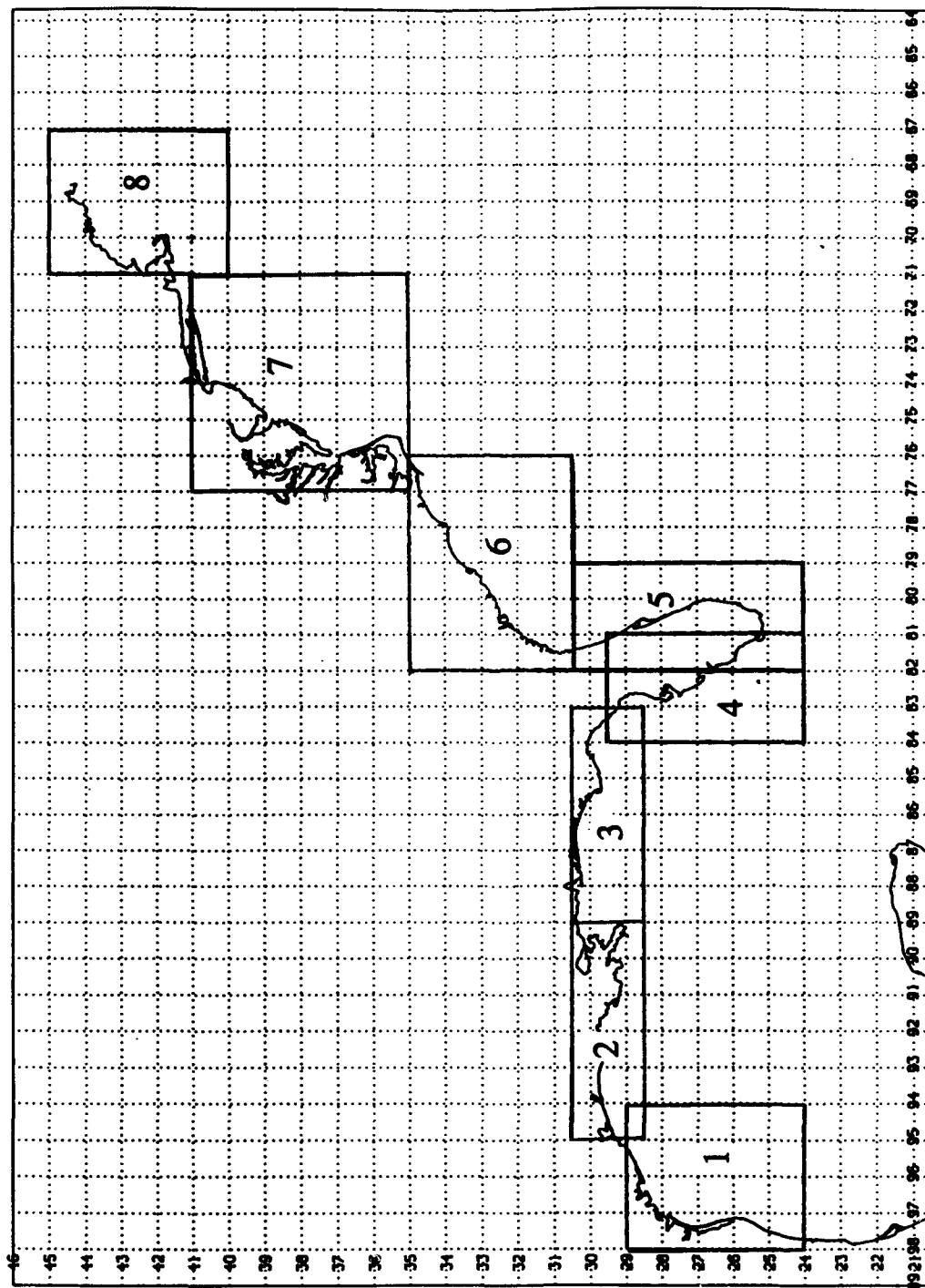


Figure 13. Coastal segment rectangles

Table 3
Historical Tropical Storm Database

1	8/12/1886	HURDAT	5	NOT NAMED	31	9/ 4/1947	HURDAT	461	NOT NAMED	101	9/ 3/1971	HURDAT	754	FERD
2	8/15/1893	HURDAT	72	NOT NAMED	32	9/20/1947	HURDAT	463	NOT NAMED	102	5/23/1972	HURDAT	711	ALPHA
3	9/27/1893	HURDAT	76	NOT NAMED	33	10/ 9/1947	HURDAT	465	NOT NAMED	103	6/14/1972	HURDAT	712	AGNES
4	9/22/1896	HURDAT	94	NOT NAMED	34	9/ 1/1948	HURDAT	471	NOT NAMED	104	9/ 1/1973	HURDAT	722	DELIA
5	8/30/1898	HURDAT	103	NOT NAMED	35	9/18/1948	HURDAT	473	NOT NAMED	105	8/29/1974	HURDAT	731	CAVREN
6	8/ 3/1899	HURDAT	112	NOT NAMED	36	10/ 3/1948	HURDAT	474	NOT NAMED	106	8/24/1975	HURDAT	739	CAROLINE
7	8/27/1900	HURDAT	117	NOT NAMED	37	8/23/1949	HURDAT	477	NOT NAMED	107	9/13/1975	HURDAT	741	ELOISE
8	8/ 4/1901	HURDAT	127	NOT NAMED	38	8/20/1950	HURDAT	490	BAKER	108	5/21/1976	HURDAT	746	SUBTROP 1
9	9/ 9/1903	HURDAT	141	NOT NAMED	39	9/ 1/1950	HURDAT	493	EASY	109	8/ 6/1976	HURDAT	748	BELLE
10	7/13/1909	HURDAT	183	NOT NAMED	60	10/13/1950	HURDAT	499	KING	110	8/29/1977	HURDAT	756	ANITA
11	9/10/1909	HURDAT	187	NOT NAMED	61	8/11/1953	HURDAT	520	BARBARA	111	9/ 3/1977	HURDAT	757	DAVE
12	10/ 6/1909	HURDAT	189	NOT NAMED	62	8/28/1953	HURDAT	521	NOT NAMED	112	7/ 9/1979	HURDAT	773	BOB
13	10/ 9/1910	HURDAT	194	NOT NAMED	63	8/28/1953	HURDAT	522	CAROL	113	8/25/1979	HURDAT	777	DAVID
14	8/23/1911	HURDAT	196	NOT NAMED	64	9/23/1953	HURDAT	526	FLORENCE	114	8/29/1979	HURDAT	779	FREDERIC
15	8/ 5/1915	HURDAT	211	NOT NAMED	65	10/ 7/1953	HURDAT	530	HAZEL	115	7/31/1980	HURDAT	783	ALLEN
16	9/22/1915	HURDAT	214	NOT NAMED	66	8/25/1954	HURDAT	535	CAROL	116	8/ 7/1981	HURDAT	797	DEANIS
17	6/29/1916	HURDAT	215	NOT NAMED	67	10/ 5/1954	HURDAT	541	HAZEL	117	11/12/1981	HURDAT	805	SUBTROP 2
18	7/11/1916	HURDAT	217	NOT NAMED	68	8/ 3/1955	HURDAT	545	CONNIE	118	6/18/1982	HURDAT	807	SUBTROP 1
19	8/12/1916	HURDAT	218	NOT NAMED	69	8/ 7/1955	HURDAT	546	DIANE	119	9/ 9/1982	HURDAT	809	CHRIS
20	10/12/1916	HURDAT	227	NOT NAMED	70	9/10/1955	HURDAT	552	LONE	120	8/15/1983	HURDAT	812	ALICIA
21	9/21/1917	HURDAT	231	NOT NAMED	71	9/21/1956	HURDAT	562	FLOREY	121	8/23/1983	HURDAT	813	DARRY
22	8/ 1/1918	HURDAT	232	NOT NAMED	72	6/25/1957	HURDAT	565	AUDREY	122	9/ 8/1984	HURDAT	820	DIANA
23	9/16/1920	HURDAT	241	NOT NAMED	73	8/24/1958	HURDAT	575	DAISY	123	8/12/1985	HURDAT	832	DANNY
24	10/20/1921	HURDAT	249	NOT NAMED	74	6/18/1959	HURDAT	584	NOT NAMED	124	8/28/1985	HURDAT	833	ELENA
25	7/22/1926	HURDAT	271	NOT NAMED	75	7/23/1959	HURDAT	586	DEBRA	125	9/16/1985	HURDAT	835	GLORIA
26	9/11/1926	HURDAT	276	NOT NAMED	76	9/20/1959	HURDAT	589	GRACIE	126	10/26/1985	HURDAT	838	JUAN
27	8/ 3/1928	HURDAT	289	NOT NAMED	77	8/29/1960	HURDAT	597	DONNA	127	11/15/1985	HURDAT	839	KATE
28	9/ 6/1928	HURDAT	292	NOT NAMED	78	9/14/1960	HURDAT	598	ETHEL	128	6/23/1986	HURDAT	841	BONNIE
29	6/27/1929	HURDAT	295	NOT NAMED	79	9/ 3/1961	HURDAT	602	CARLA	129	10/ 9/1987	HURDAT	852	FLOYD
30	9/22/1929	HURDAT	296	NOT NAMED	80	9/10/1961	HURDAT	604	ESTHER	130	9/ 7/1988	HURDAT	859	FLORENCE
31	8/31/1930	HURDAT	299	NOT NAMED	81	9/30/1961	HURDAT	606	FRANCES	131	11/17/1988	HURDAT	864	KEITH
32	8/12/1932	HURDAT	310	NOT NAMED	82	8/26/1962	HURDAT	611	ALMA	132	7/30/1989	HURDAT	867	CHANTAL
33	7/25/1933	HURDAT	324	NOT NAMED	83	10/16/1963	HURDAT	623	BINNY	133	9/10/1989	HURDAT	872	HUGO
34	8/17/1933	HURDAT	327	NOT NAMED	84	8/20/1964	HURDAT	629	CLEO	134	10/12/1989	HURDAT	874	JERRY
35	8/31/1933	HURDAT	331	NOT NAMED	85	8/28/1964	HURDAT	630	DORA					
36	9/ 8/1933	HURDAT	332	NOT NAMED	86	9/28/1964	HURDAT	634	HILDA					
37	8/29/1935	HURDAT	353	NOT NAMED	87	10/ 8/1964	HURDAT	635	ISABELL					
38	10/30/1935	HURDAT	357	NOT NAMED	88	8/27/1965	HURDAT	639	BETSY					
39	7/27/1936	HURDAT	362	NOT NAMED	89	6/ 4/1966	HURDAT	643	ALMA					
40	9/ 8/1936	HURDAT	370	NOT NAMED	90	9/21/1966	HURDAT	651	INEZ					
41	9/10/1938	HURDAT	386	NOT NAMED	91	9/ 8/1967	HURDAT	657	DORIA					
42	8/ 2/1940	HURDAT	397	NOT NAMED	92	6/ 1/1968	HURDAT	662	ABBY					
43	8/ 5/1940	HURDAT	398	NOT NAMED	93	10/13/1968	HURDAT	669	GLADYS					
44	9/16/1941	HURDAT	405	NOT NAMED	94	8/14/1969	HURDAT	672	CANVILLE					
45	7/30/1944	HURDAT	432	NOT NAMED	95	9/ 6/1969	HURDAT	676	BERNIE					
46	9/ 9/1944	HURDAT	436	NOT NAMED	96	5/17/1970	HURDAT	688	ALMA					
47	10/12/1944	HURDAT	440	NOT NAMED	97	7/31/1970	HURDAT	690	CELIA					
48	8/24/1945	HURDAT	445	NOT NAMED	98	9/ 8/1970	HURDAT	693	ELLA					
49	9/12/1945	HURDAT	449	NOT NAMED	99	8/20/1971	HURDAT	702	DORIA					
50	10/ 5/1946	HURDAT	456	NOT NAMED	100	9/ 5/1971	HURDAT	703	EDITH					

Database Output Location Selection

The ultimate goal of the tropical storm database was to provide boundary conditions data for any coastal application needing surge elevation and current information for the east and gulf coasts of the United States. In order to accomplish this task and have the database remain tractable with respect to memory requirements, discrete locations for archiving data were defined according to two criteria. First, output locations were selected to correspond to the 340 east and gulf coast WIS stations (Hubertz et al. 1993) with additional locations prescribed for Puerto Rico. The WIS stations are located at every 0.25 degree of latitude and longitude along the coastline in water depths averaging between 10 and 20 m. Spatial coverage extends from the northeast coast

of the United States, along the rim of the Gulf of Mexico, to the base of the Yucatan Peninsula and includes Puerto Rico. This domain is covered by a total of 340 WIS stations. Because this report concentrates on the 8 geographical areas along the U.S. coastline and Puerto Rico, the WIS station coverage was limited to 240 stations along the U.S. coast and Puerto Rico. WIS stations on or below 24 deg east longitude were therefore omitted from the database.

WIS stations are located at variable distances from the shoreline; therefore, additional locations were selected to represent nearshore projections of the WIS stations. The intent was to place these stations on a shore-perpendicular line joining the shore to the nearest WIS station. This procedure resulted in the selection of stations for the full 340-station WIS database and in the selection of an additional 346 stations, for a total of 686 discrete locations at which storm surge elevation and depth-averaged current (U and V) hydrographs could be archived. Locations are summarized in Figures 14 through 17. As mentioned above, nearshore stations below 24 deg longitude were omitted from the database, resulting in the selection of 246 nearshore station counterparts for the 240 WIS stations along the east and gulf coasts of the United States and Puerto Rico, for a total of 486 discrete locations at which surge elevation and current hydrograph information is archived.

Detailed shoreline maps showing the spatial distribution of WIS and nearshore stations and their individual station numbers are included in Appendix A. These labeled station numbers are necessary for locating stations of interest in Appendix B which correspond to specific storm events and for using the cross-indexing of storm events and corresponding surge elevations tabulated in Appendix C.

Included in Appendix A, following the station location maps, are the latitude and longitude of each of the initial 686 station locations, the approximate local depth at each station, and the sum of the eight primary tidal elevation constituents extracted from the DRP tidal database (Westerink, Luettich, and Scheffner 1993b). The sum of these diurnal (K_1), P_1 , and Q_1) and semidiurnal (N_2 , M_2 , S_2 , and K_2) constituents provides an indication of the maximum or minimum spring tidal amplitudes for each of the station locations. For example, the surge information contained in the atlas is made with respect to mean sea level (msl). Total surge (tide plus surge) limits can be estimated by adding and subtracting the amplitude data extracted from Appendix A to/from the reported msl surge taken from the plots of Appendix B.

For more detailed analyses requiring total event time series, the full tidal database can be accessed and used to generate a tide corresponding to the simulated event. Details of use of the tidal database are reported in Westerink, Luettich, and Scheffner (1993) and in DRP-TN-13 (1994).

Because this study was initiated to develop a database for the east and gulf coasts of the United States with limited coverage offshore of Puerto Rico, the historic events were selected as events which impacted only these areas of

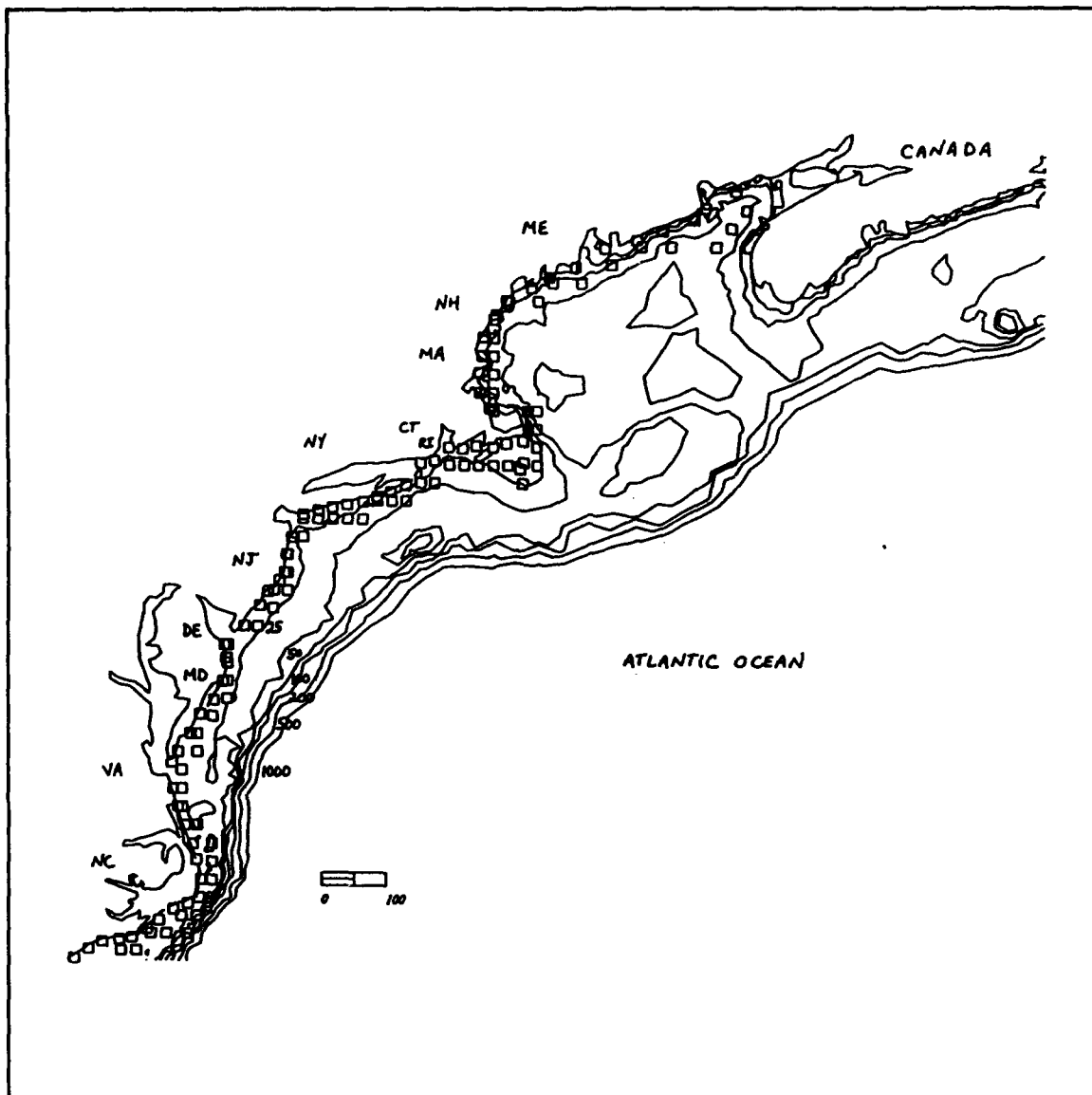


Figure 14. Locations of WIS and coastal stations in the northeastern coastal waters of North America

interest. However, the procedures described in this report can be used to evaluate the effect of any tropical event in the HURDAT database at any location in the full computational domain, including the omitted 200 WIS/nearshore stations along the coast of Mexico and the Yucatan Peninsula shown in Figures 16 and 17. Examples of numerical surge simulation studies requiring a higher spatial resolution than that used in this study are reported by Mark and Scheffner (1994).

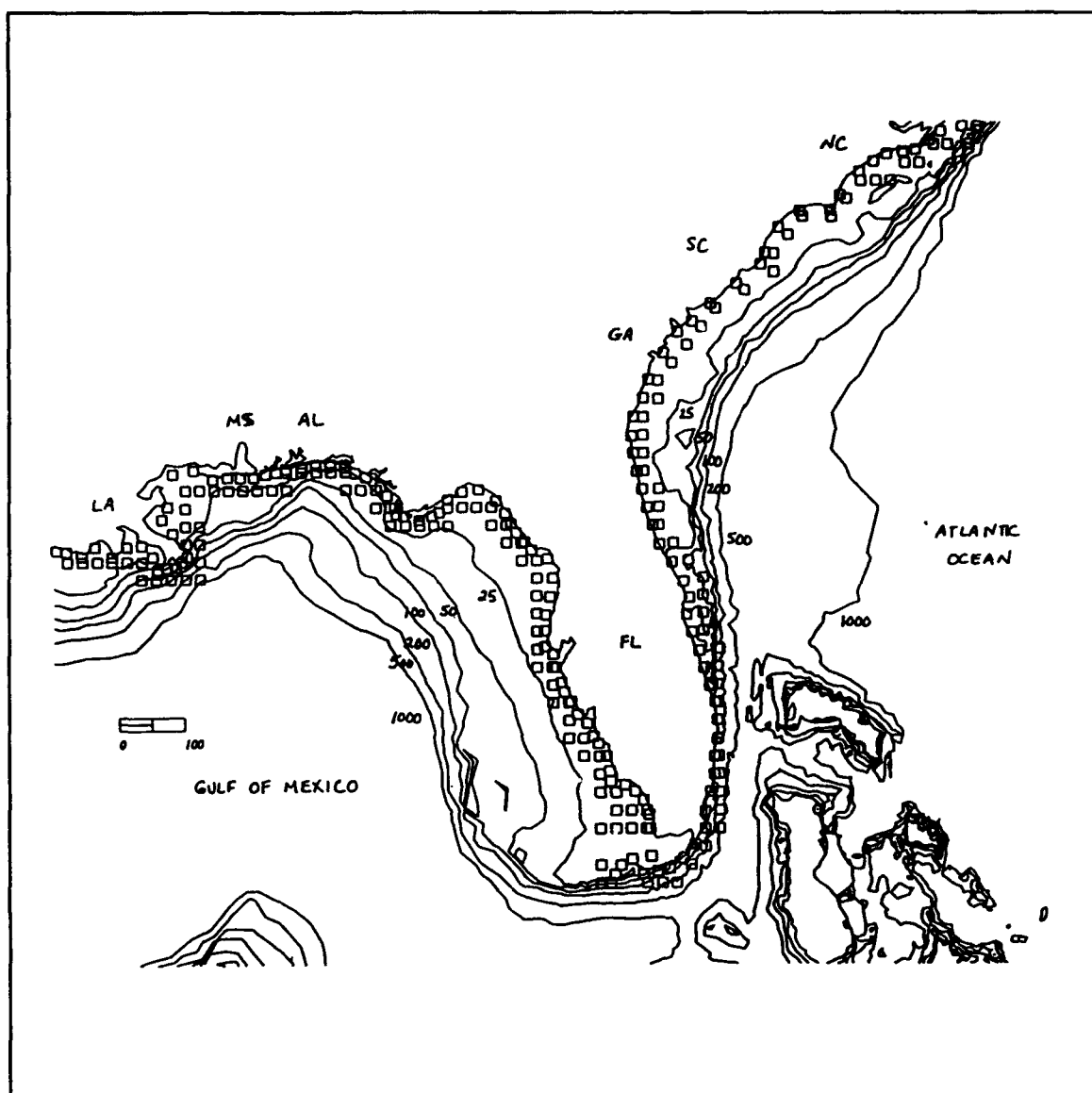


Figure 15. Locations of WIS and coastal stations around the Florida coast and along the southeastern U.S. shoreline

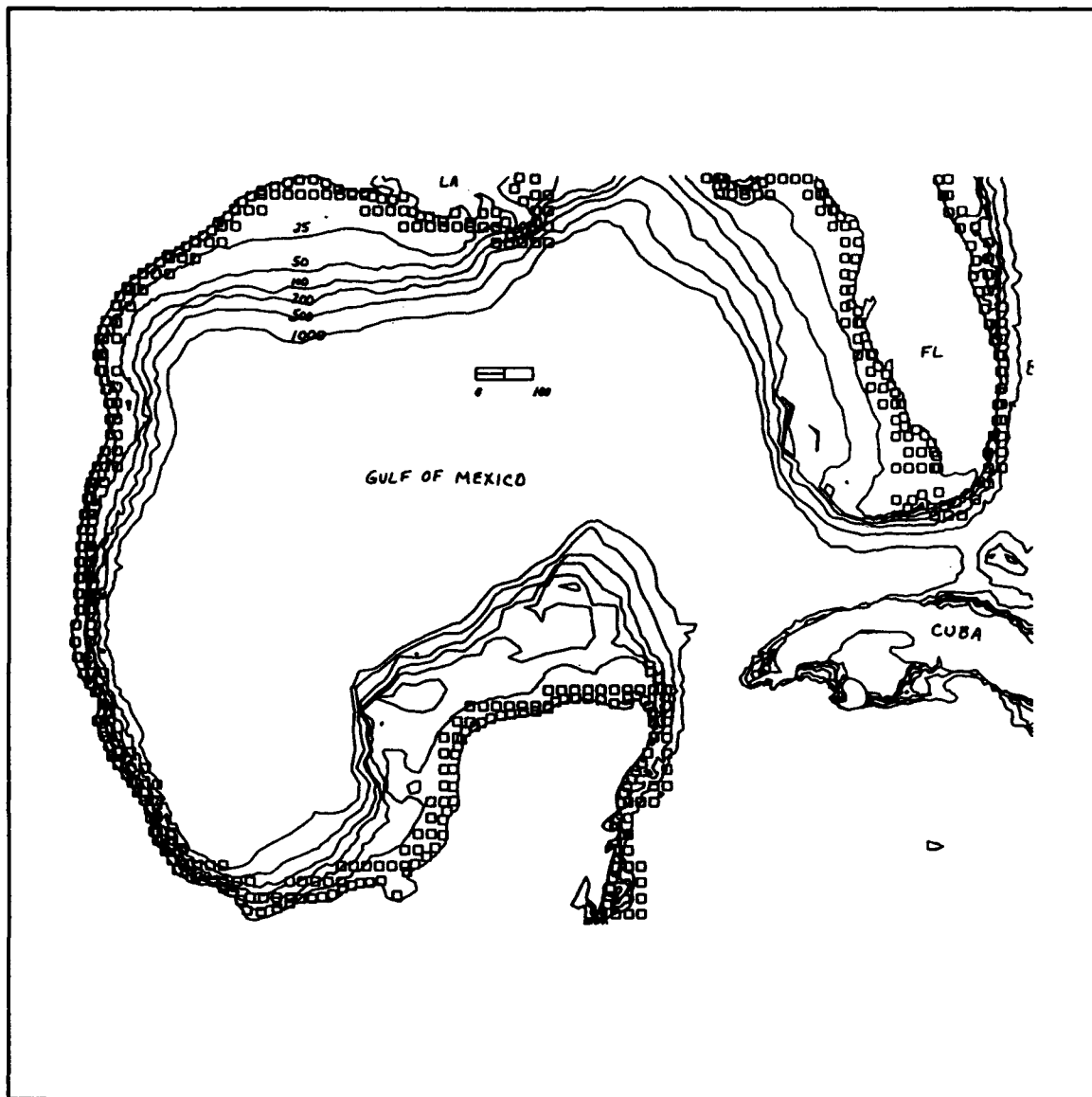


Figure 16. Locations of WIS and coastal stations around the Gulf of Mexico

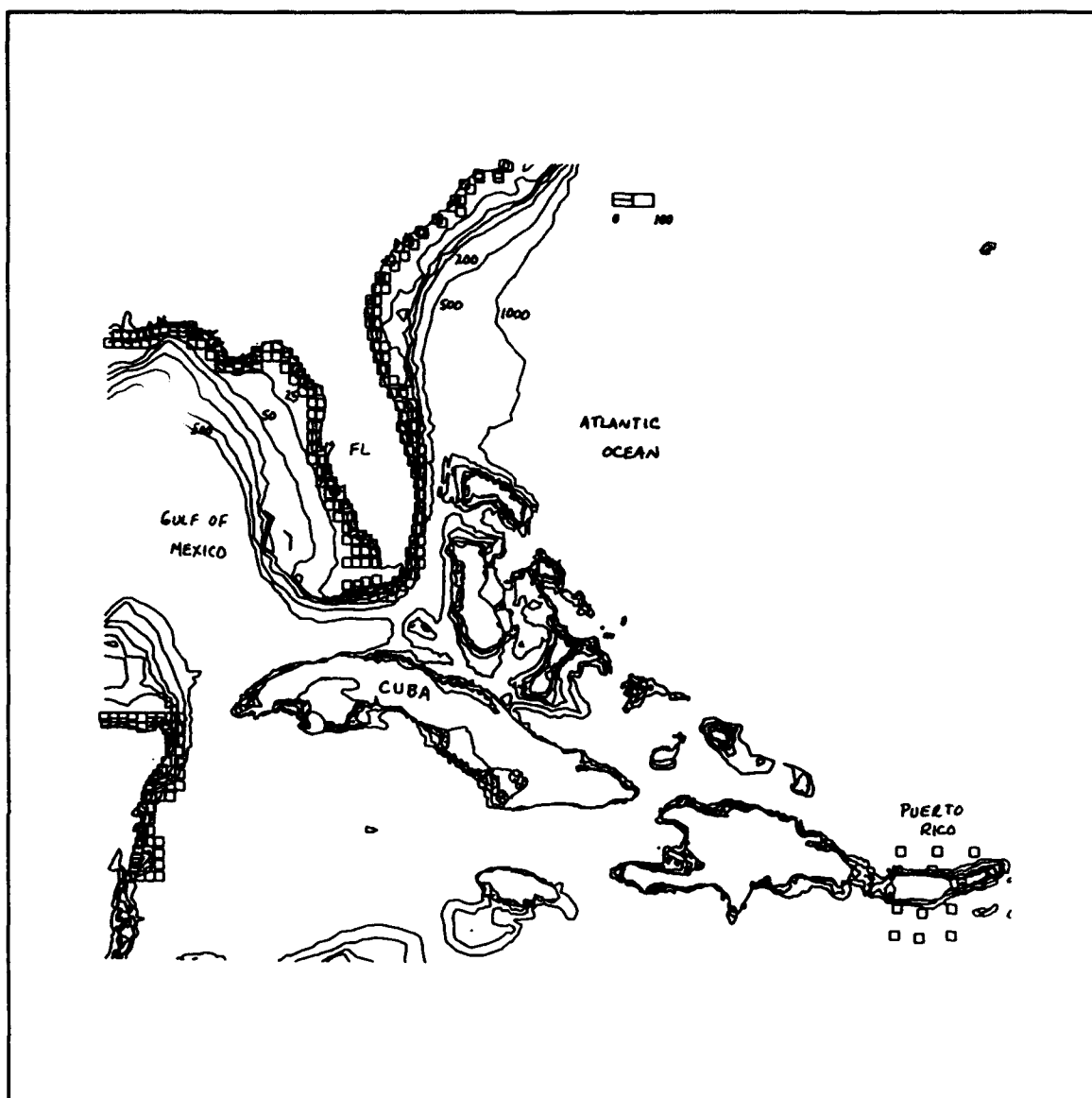


Figure 17. Locations of WIS and coastal stations near Puerto Rico

4 Storm Surge Elevation and Current Database

Surge Maximum Elevation Atlas

All 134 tropical events selected for the tropical storm database were simulated in their entirety, as documented in the HURDAT database. Computed storm surge elevations and depth-averaged velocity components were recorded every 15 min beginning with the value corresponding to 15 min after the start of the hurricane. These data were initially archived for all 486 WIS and near-shore projected stations. Output files with the elevation and velocity station data appropriate for each historical hurricane are in a format consistent with the ADCIRC-2DDI model station output files (Luetich, Westerink, and Scheffner 1992).

Because each hurricane event does not impact every coastal station, the final database was constructed such that surge information was only archived for locations at which a maximum surge elevation of 0.3048 m (1.0 ft) or greater was computed. In order to eliminate possible startup or termination transients or far field discontinuities which might propagate beyond the edge of the nested PBL model in the reported surge values, potential impacted stations were also required to be within a 200-mile radius of the eye of the storm. Maximum surge was selected as the maximum elevation on the surge elevation hydrograph in a ± 6 -hr window from the time (nearest hour) when the hurricane eye is nearest to the selected station.

The atlas of the nearshore spatial distribution of maximum surge elevations contained in Appendix B was generated as a tool for identifying storms which impacted specific locations along the east and gulf coast areas and offshore of Puerto Rico. A typical component of the atlas is shown in Figure 18 for Hurricane Bonnie, whose track location is shown in Figure 1 and whose HURDAT information is shown in Table 1. This figure contains a summary plot of the total storm track according to the track information contained in the HURDAT database, as well as a landfall or near-landfall map enlargement detailing surge magnitude and distribution. If additional information concerning variability of this reported surge in the presence of tides is required, the 8-constituent spring tide amplitude for each station is included in Appendix A.

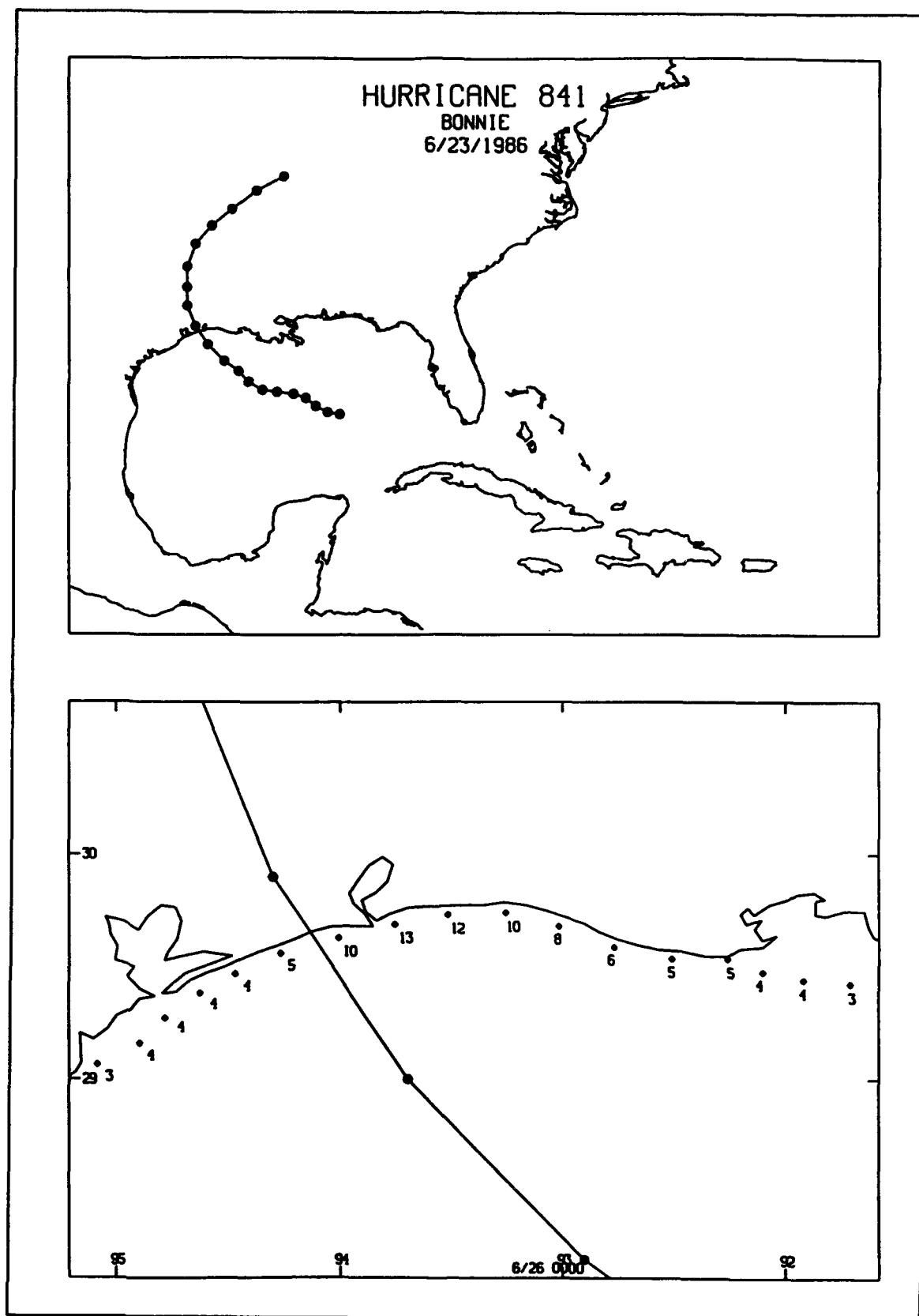


Figure 18. Track and surge atlas for Hurricane Bonnie

In order to maximize the readability by reducing the density of information contained on the plots of Appendix B, surge elevations are reported in decimeters (10 dm = 1 m). For example, the maximum surge for Hurricane Bonnie in Figure 18 is shown to be 13 dm (1.3 m) at the second nearshore station to the east of landfall. From the location maps of Appendix A, this station can be identified as nearshore station No. 539. The reference tables at the end of Appendix A indicate that station No. 539 is located at 93.7569 deg west longitude and 29.6873 deg north latitude and has an approximate spring tide amplitude of 0.8435 m and an approximate depth of 6.5 m.

The summary database of storm-specific maximum surge elevations for the nearshore gauges has been cross-indexed so that the user can determine the spatial alongshore impact of each historic event as well as which historic events impacted a specific WIS/nearshore station. This information is presented in two-sequence tabular form in Appendix C. The first portion of Appendix C contains a title containing the HURDAT storm number and the number of WIS/nearshore stations impacted by that storm event (limited to a minimum surge of 0.3048 m and located within 200 miles of the eye of the event) followed by a tabulation of stations impacted and their respective maximum surge elevations in decimeters. The intended purpose of the indexed surge data presented in Appendix C is to provide a comprehensive listing of storms, their areas of impact, and their intensity as measured by their maximum surge. These data can then be used to identify and access the WIS/nearshore database of tropical events for use as surge elevation and current boundary conditions for evaluating the fate and stability of offshore disposal sites. Although disposal site analysis was the purpose of the creation of the database, the data can readily be used to evaluate any coastal or nearshore submerged feature. Current applications other than site stability include dune erosion modeling and coastal flooding.

An example application of the cross-indexing is presented in Table 4, an extracted example for HURDAT No. 841 (Hurricane Bonnie). As shown, event No. 841 impacted 31 WIS/nearshore stations with station No. 539 showing a maximum surge of 13 dm. The second portion of Appendix C presents a tabulation of events which impacted each specific WIS/nearshore station and the surge produced by each storm. For example, Table 5 presents an example listing for nearshore station 539. As shown in the table, station 539 was impacted by 25 tropical events with HURDAT No. 841 producing a maximum surge elevation of 13 dm.

Table 4

WIS/Nearshore Stations Impacted by HURDAT No. 841

HURDAT STORM 841, # STATIONS-MAX SURGE 31																			
133- 3	134- 4	135- 4	136- 4	137- 5	138- 7	139- 8	140- 8	141- 7	142- 6	143- 5	144- 5	145- 5	146- 3	530- 3					
531- 4	532- 4	533- 8	534- 5	535- 6	536- 8	537-10	538-12	539-13	540-10	541- 5	542- 4	543- 4	544- 4	545- 4					
546- 3																			

Table 5
HURDAT Events Impacting WIS/Nearshore Station No. 539

WIS/NEARSHORE STATION 539, 0 HURDAT STORMS-MAX SURGE 25														
5- 4	117-23	183-10	211-36	232-14	293- 4	310-54	324- 5	397-15	405-23	445-11	565-26	586-10	602-22	690- 8
703- 9	704- 5	722-18	731- 6	809-17	812-24	832- 3	841-13	867-16	874-13					

The following paragraphs describe the computer-based portion of the database containing the elevation and current hydrographs corresponding to each of the storms and stations contained in Appendices A, B, and C.

Surge Elevation and Current Database

The storm elevation and current hydrograph database for both nearshore and WIS stations is available through CERC. The database consists of 134 separate files, each containing the height and U and V velocity components at 15-min increments for the WIS and nearshore stations located offshore of the U.S. east and Gulf of Mexico coasts and for selected locations offshore of Puerto Rico

Each file begins with header information containing the HURDAT storm number, start time, duration of the event in hours, hydrograph start time (storm start + 15 min), number of points, and time interval between points. The identification data is followed by sequential files corresponding to each WIS or nearshore station. Each station contains sequential listings of time series of the surface elevation (m), the U velocity (east in m/sec), and the V velocity (north in m/sec). Each storm file contains the stations referenced in Appendix C. The example header file and station file corresponding to nearshore station No. 539 are shown in Table 6. A plot of the data in Table 6 is shown in Figure 19.

As evidenced by the Appendices, Table 6, and Figure 19, the tropical event database described in this report is highly informative, easily assessable, and useful for a variety of preliminary or detailed coastal evaluations of storm intensity and/or storm impact. This database represents a unique assembly of offshore and nearshore elevation and current time series data which are not available from any single source.

Table 6

Database Representation of HURDAT Storm 841, Nearshore Station No. 539

HURDAT STORM NUMBER: 841

STORM START TIME (YR/MO/DAY/HOUR): 1986/ 6/23/18. 0000 = 114

HYDROGRAPH START TIME (YR/MO/DAY/HOUR): 1986/ 6/23/18.25. 0000 = 456 AT 15.0 MIN INCR

STATION: 539 LONGITUDE, LATITUDE: -93.7570 29.6870

SURFACE ELEVATION (ft)

0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.008	0.007	0.011	0.012	0.014	0.016	0.019	0.022	0.025
0.028	0.032	0.036	0.040	0.043	0.047	0.052	0.057	0.061	0.064	0.067	0.069	0.071	0.073	0.075	0.078
0.081	0.083	0.086	0.088	0.091	0.094	0.096	0.098	0.101	0.103	0.106	0.108	0.110	0.113	0.115	0.118
0.119	0.120	0.121	0.121	0.121	0.121	0.122	0.122	0.123	0.125	0.126	0.128	0.130	0.133	0.135	0.137
0.138	0.140	0.141	0.142	0.143	0.143	0.143	0.144	0.143	0.143	0.143	0.142	0.141	0.140	0.139	0.137
0.138	0.137	0.136	0.135	0.133	0.132	0.130	0.128	0.126	0.124	0.122	0.119	0.117	0.116	0.114	0.112
0.110	0.109	0.108	0.107	0.106	0.106	0.106	0.106	0.107	0.108	0.109	0.111	0.112	0.114	0.115	0.116
0.118	0.119	0.120	0.120	0.121	0.122	0.123	0.124	0.124	0.126	0.127	0.128	0.130	0.132	0.135	0.137
0.139	0.142	0.145	0.149	0.152	0.156	0.160	0.164	0.168	0.173	0.176	0.180	0.184	0.188	0.193	0.197
0.202	0.207	0.211	0.216	0.220	0.225	0.229	0.233	0.237	0.240	0.243	0.247	0.250	0.254	0.256	0.259
0.261	0.263	0.266	0.269	0.271	0.274	0.276	0.278	0.280	0.282	0.283	0.284	0.285	0.286	0.288	0.289
0.291	0.294	0.296	0.298	0.301	0.303	0.306	0.309	0.312	0.315	0.317	0.319	0.321	0.324	0.326	0.328
0.329	0.331	0.332	0.334	0.336	0.338	0.339	0.340	0.340	0.340	0.340	0.340	0.340	0.339	0.338	0.337
0.337	0.338	0.340	0.340	0.341	0.341	0.342	0.342	0.343	0.344	0.345	0.346	0.348	0.351	0.353	0.356
0.359	0.362	0.366	0.373	0.381	0.388	0.395	0.401	0.406	0.413	0.421	0.429	0.439	0.451	0.463	0.478
0.494	0.511	0.533	0.557	0.584	0.618	0.661	0.708	0.762	0.826	0.897	0.972	1.049	1.121	1.187	1.244
1.286	1.304	1.299	1.278	1.242	1.193	1.133	1.069	1.003	0.938	0.877	0.817	0.763	0.715	0.673	0.634
0.599	0.569	0.543	0.519	0.497	0.477	0.459	0.444	0.431	0.420	0.409	0.400	0.391	0.385	0.380	0.377
0.375	0.373	0.368	0.360	0.351	0.340	0.329	0.318	0.308	0.297	0.286	0.276	0.265	0.255	0.244	0.233
0.220	0.207	0.195	0.182	0.168	0.153	0.138	0.121	0.102	0.083	0.063	0.043	0.024	0.006	-0.011	-0.025
-0.036	-0.044	-0.049	-0.052	-0.051	-0.048	-0.042	-0.032	-0.020	-0.005	0.011	0.028	0.045	0.060	0.075	0.089
0.102	0.114	0.124	0.132	0.138	0.142	0.144	0.143	0.141	0.137	0.131	0.123	0.114	0.104	0.094	0.083
0.072	0.062	0.051	0.040	0.030	0.020	0.011	0.002	-0.005	-0.011	-0.015	-0.018	-0.020	-0.020	-0.019	-0.016
-0.013	-0.008	-0.002	0.004	0.012	0.020	0.029	0.038	0.047	0.056	0.065	0.074	0.081	0.088	0.094	0.098
0.100	0.100	0.099	0.096	0.091	0.086	0.080	0.073	0.066	0.059	0.052	0.045	0.039	0.033	0.027	0.022
0.017	0.011	0.006	0.001	-0.004	-0.009	-0.012	-0.015	-0.016	-0.017	-0.016	-0.015	-0.013	-0.011	-0.008	-0.004
0.000	0.005	0.010	0.015	0.020	0.026	0.030	0.035	0.038	0.041	0.043	0.044	0.044	0.044	0.042	0.040
0.037	0.033	0.028	0.023	0.018	0.012	0.006	0.000	-0.006	-0.012	-0.018	-0.023	-0.028	-0.033	-0.037	-0.040
-0.043	-0.045	-0.046	-0.047	-0.047	-0.046	-0.045	-0.044								

U (EAST) VELOCITY (ft/SEC)

-0.004	-0.008	-0.013	-0.017	-0.021	-0.025	-0.029	-0.033	-0.036	-0.039	-0.042	-0.045	-0.047	-0.050	-0.052	-0.055
-0.057	-0.060	-0.063	-0.065	-0.068	-0.071	-0.073	-0.075	-0.077	-0.080	-0.083	-0.085	-0.087	-0.089	-0.090	-0.092
-0.093	-0.094	-0.095	-0.096	-0.097	-0.098	-0.099	-0.099	-0.099	-0.099	-0.099	-0.098	-0.098	-0.098	-0.098	-0.097
-0.097	-0.097	-0.098	-0.098	-0.099	-0.100	-0.101	-0.102	-0.103	-0.103	-0.104	-0.104	-0.104	-0.105	-0.105	-0.106
-0.106	-0.107	-0.108	-0.108	-0.109	-0.110	-0.112	-0.113	-0.114	-0.114	-0.115	-0.115	-0.116	-0.116	-0.116	-0.115
-0.115	-0.115	-0.115	-0.115	-0.115	-0.115	-0.116	-0.116	-0.117	-0.117	-0.118	-0.119	-0.120	-0.121	-0.122	-0.123
-0.124	-0.125	-0.126	-0.127	-0.128	-0.129	-0.129	-0.129	-0.130	-0.130	-0.130	-0.131	-0.131	-0.132	-0.133	-0.133
-0.134	-0.135	-0.136	-0.138	-0.139	-0.140	-0.141	-0.142	-0.143	-0.144	-0.144	-0.145	-0.145	-0.145	-0.145	-0.145
-0.145	-0.145	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144	-0.144	-0.145	-0.145	-0.145
-0.146	-0.146	-0.146	-0.147	-0.147	-0.148	-0.148	-0.149	-0.150	-0.151	-0.151	-0.152	-0.152	-0.152	-0.152	-0.152
-0.152	-0.152	-0.152	-0.152	-0.152	-0.152	-0.152	-0.152	-0.153	-0.153	-0.154	-0.154	-0.154	-0.155	-0.155	-0.155
-0.155	-0.155	-0.155	-0.155	-0.155	-0.155	-0.155	-0.155	-0.155	-0.156	-0.156	-0.156	-0.156	-0.156	-0.156	-0.156
-0.156	-0.156	-0.156	-0.156	-0.156	-0.156	-0.157	-0.157	-0.158	-0.158	-0.159	-0.160	-0.160	-0.161	-0.161	-0.162
-0.163	-0.163	-0.164	-0.166	-0.167	-0.169	-0.171	-0.173	-0.175	-0.178	-0.181	-0.184	-0.187	-0.191	-0.195	-0.199
-0.203	-0.208	-0.214	-0.221	-0.228	-0.236	-0.245	-0.255	-0.266	-0.279	-0.292	-0.306	-0.322	-0.340	-0.361	-0.382
-0.407	-0.436	-0.466	-0.498	-0.530	-0.563	-0.593	-0.622	-0.648	-0.670	-0.689	-0.705	-0.706	-0.688	-0.662	-0.632
-0.595	-0.552	-0.508	-0.464	-0.425	-0.394	-0.365	-0.333	-0.302	-0.274	-0.245	-0.215	-0.184	-0.152	-0.120	-0.086
-0.052	-0.017	0.017	0.048	0.076	0.101	0.121	0.137	0.150	0.159	0.166	0.170	0.172	0.173	0.174	0.174
0.173	0.168	0.163	0.156	0.149	0.142	0.135	0.130	0.125	0.122	0.120	0.119	0.120	0.122	0.125	0.128
0.131	0.134	0.136	0.137	0.137	0.136	0.133	0.130	0.126	0.122	0.117	0.112	0.107	0.102	0.098	0.093
0.088	0.083	0.078	0.073	0.068	0.063	0.059	0.056	0.052	0.050	0.047	0.045	0.042	0.040	0.038	0.036
0.033	0.030	0.027	0.023	0.019	0.014	0.008	0.003	-0.002	-0.007	-0.011	-0.015	-0.017	-0.019	-0.020	-0.019
-0.018	-0.016	-0.013	-0.009	-0.005	-0.001	0.004	0.008	0.012	0.016	0.020	0.022	0.024	0.026	0.027	0.027
0.027	0.026	0.025	0.023	0.022	0.020	0.019	0.018	0.017	0.017	0.017	0.018	0.020	0.022	0.024	0.026
0.029	0.031	0.033	0.035	0.037	0.040	0.043	0.045	0.049	0.052	0.056	0.060	0.063	0.066	0.069	0.072

(Continued)

Table 6 (Concluded)

0.073	0.074	0.075	0.076	0.076	0.076	0.076	0.076	0.077	0.078	0.079	0.080	0.082	0.083	0.084	0.085
0.086	0.087	0.087	0.088	0.088	0.087	0.087	0.086	0.085	0.084	0.083	0.082	0.082	0.081	0.081	0.081
0.081	0.082	0.083	0.084	0.085	0.086	0.088	0.089	0.091	0.093	0.094	0.095	0.096	0.097	0.098	0.098
0.098	0.098	0.097	0.097	0.096	0.095	0.095	0.094								
V (NORTH) VELOCITY (M/SEC)															
-0.002	-0.004	-0.006	-0.008	-0.010	-0.012	-0.013	-0.015	-0.017	-0.018	-0.020	-0.021	-0.022	-0.023	-0.024	-0.025
-0.026	-0.027	-0.028	-0.030	-0.031	-0.031	-0.032	-0.033	-0.034	-0.036	-0.038	-0.039	-0.040	-0.040	-0.041	-0.041
-0.041	-0.041	-0.042	-0.042	-0.043	-0.043	-0.044	-0.044	-0.044	-0.044	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043
-0.043	-0.043	-0.044	-0.044	-0.045	-0.045	-0.046	-0.046	-0.046	-0.046	-0.046	-0.046	-0.046	-0.046	-0.046	-0.047
-0.047	-0.048	-0.048	-0.049	-0.049	-0.050	-0.051	-0.051	-0.052	-0.052	-0.053	-0.053	-0.053	-0.053	-0.053	-0.053
-0.053	-0.053	-0.053	-0.054	-0.054	-0.054	-0.054	-0.054	-0.055	-0.055	-0.056	-0.056	-0.056	-0.057	-0.057	-0.057
-0.058	-0.058	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.059	-0.060	-0.060
-0.061	-0.061	-0.062	-0.062	-0.063	-0.063	-0.064	-0.064	-0.065	-0.065	-0.065	-0.065	-0.065	-0.066	-0.066	-0.066
-0.064	-0.063	-0.063	-0.063	-0.063	-0.063	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062	-0.062
-0.062	-0.062	-0.063	-0.063	-0.063	-0.063	-0.064	-0.064	-0.065	-0.065	-0.065	-0.066	-0.066	-0.066	-0.066	-0.066
-0.066	-0.066	-0.066	-0.066	-0.066	-0.066	-0.066	-0.066	-0.067	-0.067	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068
-0.068	-0.067	-0.067	-0.067	-0.068	-0.067	-0.067	-0.067	-0.067	-0.067	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068
-0.068	-0.068	-0.068	-0.068	-0.068	-0.068	-0.069	-0.070	-0.070	-0.071	-0.071	-0.071	-0.072	-0.072	-0.073	-0.072
-0.072	-0.072	-0.072	-0.074	-0.075	-0.075	-0.076	-0.077	-0.078	-0.079	-0.081	-0.082	-0.082	-0.084	-0.085	-0.087
-0.089	-0.091	-0.092	-0.094	-0.096	-0.101	-0.106	-0.110	-0.115	-0.120	-0.124	-0.130	-0.135	-0.142	-0.149	-0.157
-0.165	-0.175	-0.185	-0.195	-0.204	-0.210	-0.215	-0.222	-0.224	-0.224	-0.225	-0.227	-0.224	-0.218	-0.211	-0.204
-0.202	-0.201	-0.195	-0.186	-0.178	-0.174	-0.168	-0.158	-0.145	-0.133	-0.120	-0.106	-0.090	-0.073	-0.057	-0.040
-0.023	-0.005	0.011	0.026	0.038	0.049	0.058	0.065	0.070	0.074	0.075	0.076	0.078	0.079	0.080	0.081
0.079	0.075	0.070	0.065	0.061	0.057	0.054	0.051	0.049	0.047	0.046	0.045	0.045	0.046	0.047	0.047
0.047	0.048	0.049	0.049	0.048	0.046	0.044	0.042	0.039	0.037	0.034	0.033	0.031	0.030	0.030	0.030
0.030	0.030	0.030	0.030	0.030	0.029	0.030	0.030	0.031	0.031	0.031	0.030	0.029	0.027	0.026	0.024
0.022	0.020	0.018	0.014	0.011	0.007	0.003	-0.001	-0.005	-0.008	-0.011	-0.014	-0.016	-0.017	-0.017	-0.017
-0.016	-0.015	-0.014	-0.012	-0.010	-0.007	-0.004	-0.001	0.002	0.004	0.007	0.009	0.012	0.013	0.015	0.016
0.017	0.017	0.018	0.018	0.018	0.018	0.018	0.017	0.017	0.017	0.017	0.017	0.017	0.018	0.018	0.018
0.018	0.018	0.018	0.018	0.018	0.018	0.019	0.020	0.021	0.022	0.024	0.026	0.028	0.029	0.030	0.031
0.032	0.032	0.032	0.033	0.033	0.033	0.034	0.034	0.035	0.036	0.037	0.038	0.039	0.040	0.041	0.042
0.043	0.043	0.044	0.044	0.044	0.043	0.043	0.042	0.041	0.040	0.039	0.038	0.037	0.037	0.036	0.035
0.035	0.035	0.035	0.035	0.035	0.036	0.036	0.037	0.038	0.039	0.039	0.040	0.041	0.042	0.042	0.043
0.043	0.043	0.044	0.044	0.044	0.044	0.044	0.044								

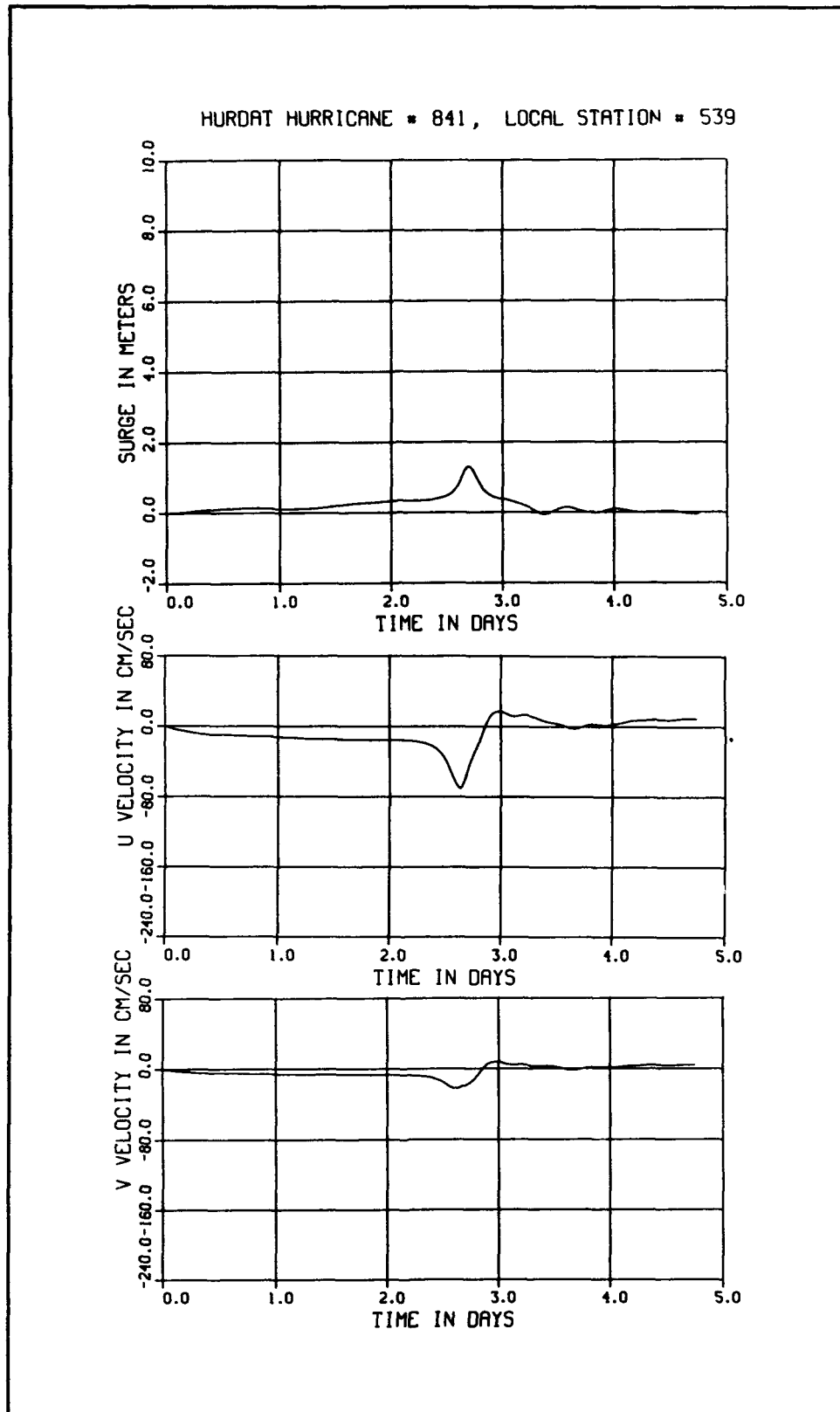


Figure 19. Hydrograph time series plot of Table 4

5 Conclusions

This report describes a database of tropical storm surge elevation and current hydrograph time series which can be used as boundary conditions for evaluating the fate and stability of dredged material disposed in open water. The data were numerically generated in response to 134 historically based tropical storms which impacted the east and gulf coasts of the United States. Because tides are not included in the simulations and storm parameters were not optimized to prototype conditions, the selected storms are not intended to be hindcasts of specific events. Rather, the simulated events are intended to approximate a number of historically based storms in order to generate a database of responses which are realistic in magnitude, duration, and shape.

The database described in this report is unique in that it provides realistic data for 486 discrete locations along the east and gulf coasts of the United States as well as for selected locations around the island of Puerto Rico. In addition to the hydrograph database, this report includes an atlas of storm track propagation for the 134 historically based events and their spatial peak surge elevations archived at up to 486 impacted locations. The events used in the simulations were selected from the 104-year HURDAT database of storm track information.

The potential use of such a database goes far beyond the testing of disposal site stability. The data reported herein can be used to provide offshore or nearshore boundary conditions for any type of coastal modeling or analysis requiring elevation or current data. Examples of its use have been demonstrated in dune/berm erosion studies as well as in studies of the relationship between storm surge elevation and frequency of occurrence.

Cross-referencing tables are provided such that locations impacted by each storm event are itemized according to station number and storm-induced peak surge elevation. Also, each of the 486 stations is referenced according to storm events which impacted it and the peak surge corresponding to those events. Through cross-referencing, design events can be selected for detailed analysis, and event frequency information can be obtained for subsequent frequency analyses. The full database can then be accessed to develop time series boundary conditions for use in any coastal design and analysis requiring time series of tropical storm surge data. The following paragraphs summarize

the basis for the storm simulations and the procedures required to develop this unique database.

A viable approach to forecasting storm surge heights along the eastern U.S. and gulf coasts is to rely on information regarding past hurricanes, their associated storm surge, and their spatial impact. Estimations of storm surge intensity expected from some future hurricane can be made by referencing a database containing historically based storm surge elevation and current data. Such a database would necessarily include a time history of storm surge heights and currents from a large sampling of historically based hurricanes at many spatially distributed points.

In this work, a database of storm surge elevations and depth-averaged velocity values is generated from the numerical simulation of multiple hurricanes. The ADCIRC-2DDI hydrodynamic model was used for these storm surge simulations and has been demonstrated to produce accurate predictions of both the primary storm surge and resonant modes excited by the storm. Simulation accuracy was enhanced through the use of a very large computational domain which encompassed the western North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico.

Because of the size of the domain, open-ocean boundary conditions were specified in the mid-Atlantic Ocean. This simple boundary condition specification, far removed from influences of the continental shelf, minimized the influence of boundary condition specification on storm surge generation in the coastal region. Basin resonant modes and basin-to-basin interactions are therefore accurately reproduced through use of this domain. Computationally, the ADCIRC model is coupled with the physically realistic PBL wind model. As a result, model simulations lead to computed surge characteristics which are consistent with recorded prototype data.

The finite element formulation implemented in the ADCIRC hydrodynamic model facilitates use of such a large computational domain. Flexibility of the finite element method leads to easy incorporation of coastline detail and nodal densities which can range from three to four orders of magnitude in spatial resolution. This wide variation in nodal density arises due to hydrodynamic considerations of surge propagating from deep open water to the coast zone. These considerations require high grid resolution in shallow coastal areas, in regions of complex coastlines and/or bathymetric change, and in regions of significant storm surge caused by, for example, focusing effects and coarse discretizations in the deep ocean where processes occur gradually.

The efficiency of the finite element method leads to a discrete problem, associated with the large domain, which remains well within computational limits. A preprocessor is applied to the ADCIRC model such that it is optimized for speed when running on a vector supercomputer such as the CRAY-YMP 6128. The 22,711-node grid and 686 elevation and velocity stations have memory requirements of 6.16 MegaWords (MW), which are also set by

the preprocessor. The CPU time utilized for an average storm length of 11 days is 2.3 hr.

The tropical storm database for the east and Gulf of Mexico coasts has been completed and serves as a source of boundary conditions for support of dredging activities as well as any other coastal zone application requiring storm surge data. Two major conclusions are reached following completion of this project. First, the accuracy, flexibility, and ease of applicability of this numerical approach of coupling the HURDAT data, the PBL model, the tidal database, and the ADCIRC hydrodynamic model on a continental-scale, high-resolution grid has been demonstrated. Results imply that an application to real-time predictions of storm propagation should be pursued. Second, the primary goal of the project has greatly exceeded original expectations by representing a very comprehensive and realistic database of storm data which can be used for a great variety of applications in coastal engineering.

6 Recommendations

As concluded above, the tropical storm database is highly successful in providing surge elevation and current data which are realistically representative of historic events that have impacted the east and gulf coasts of the United States. However, it has also been stated that rigorous verification of the simulations to prototype data were not conducted due to limitations in time and funding. The primary recommendation of this report is that these verification efforts be conducted. The resulting product would be not only a database of realistic representations of historic events, but a database of verified hindcasts of historic events as well.

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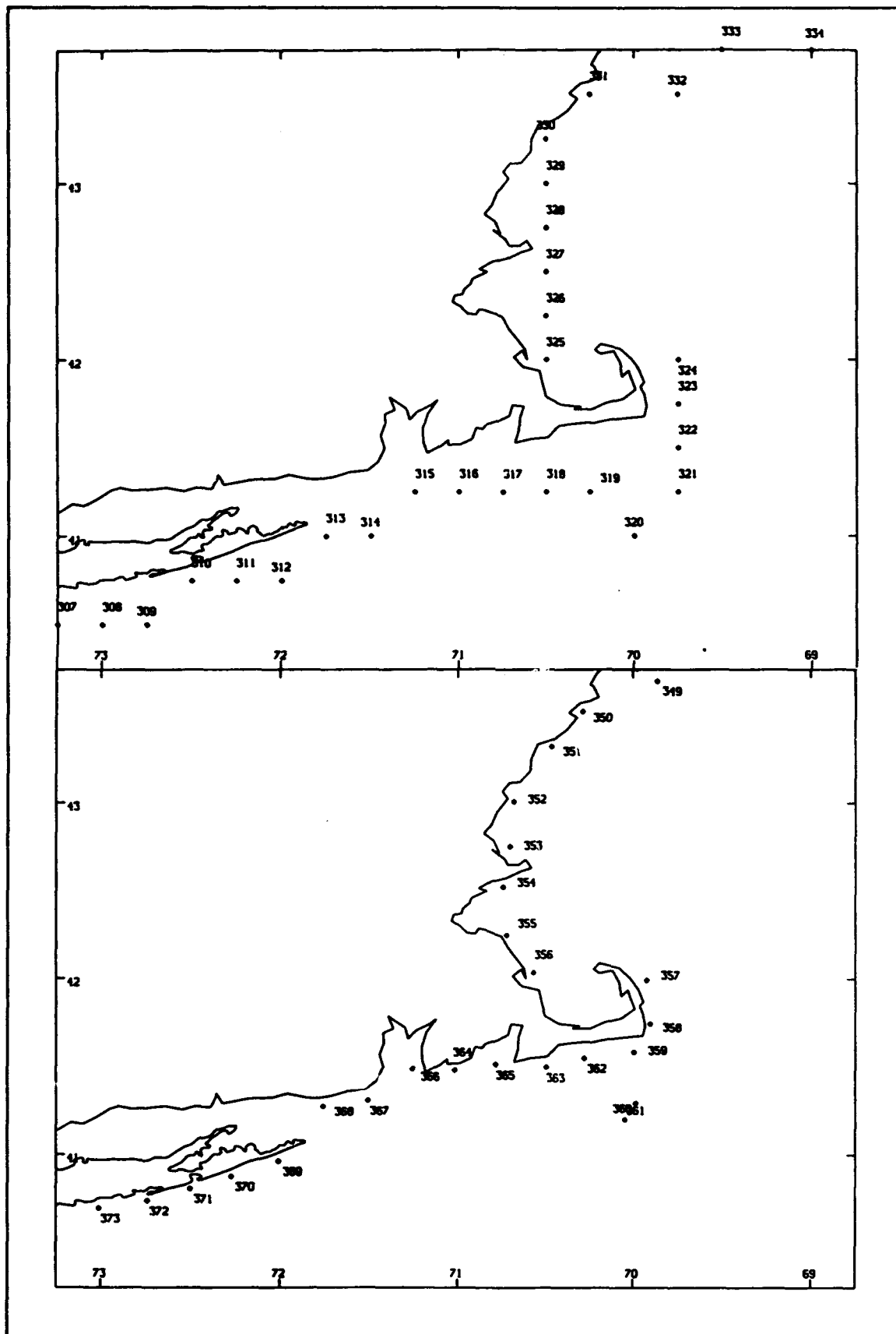
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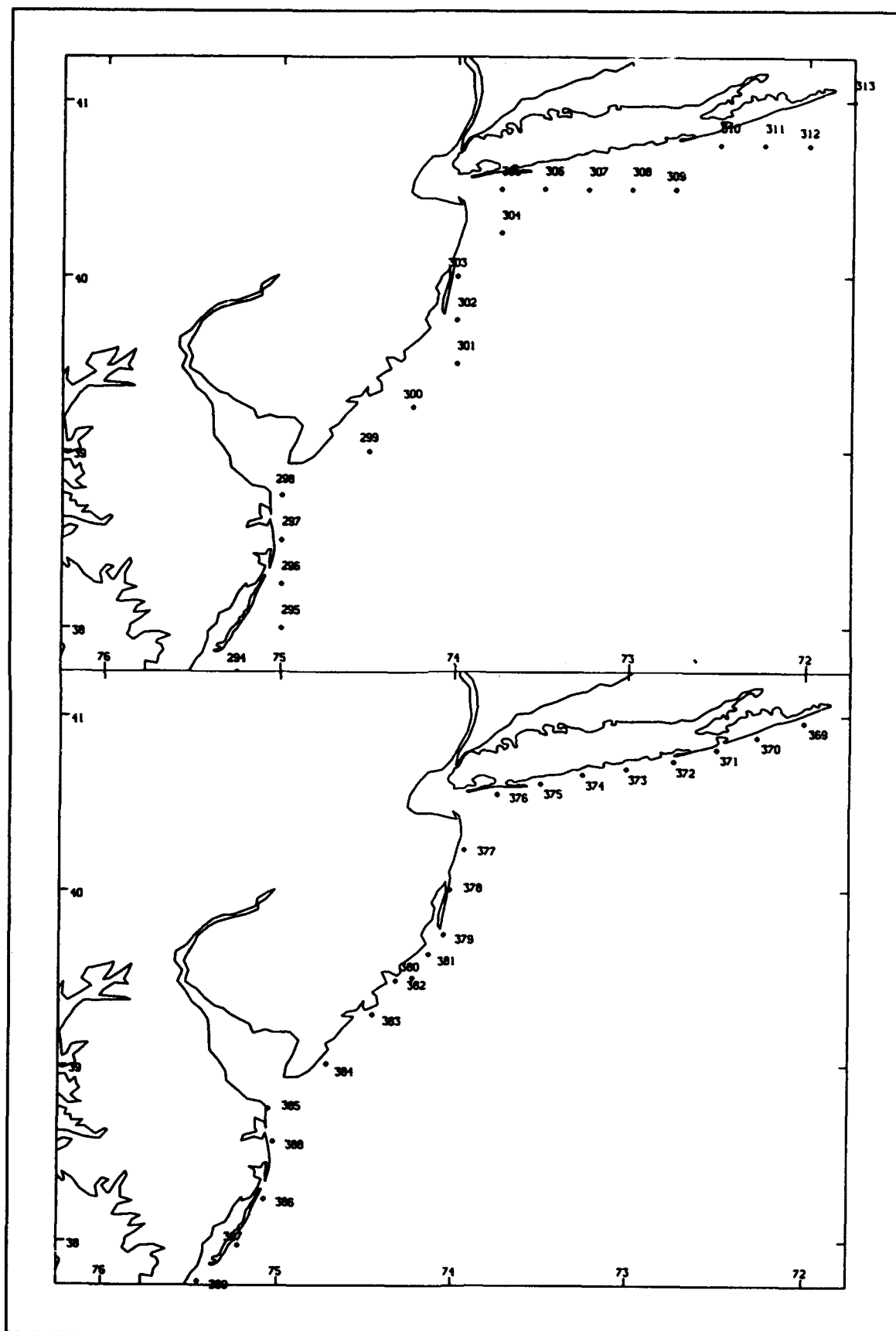
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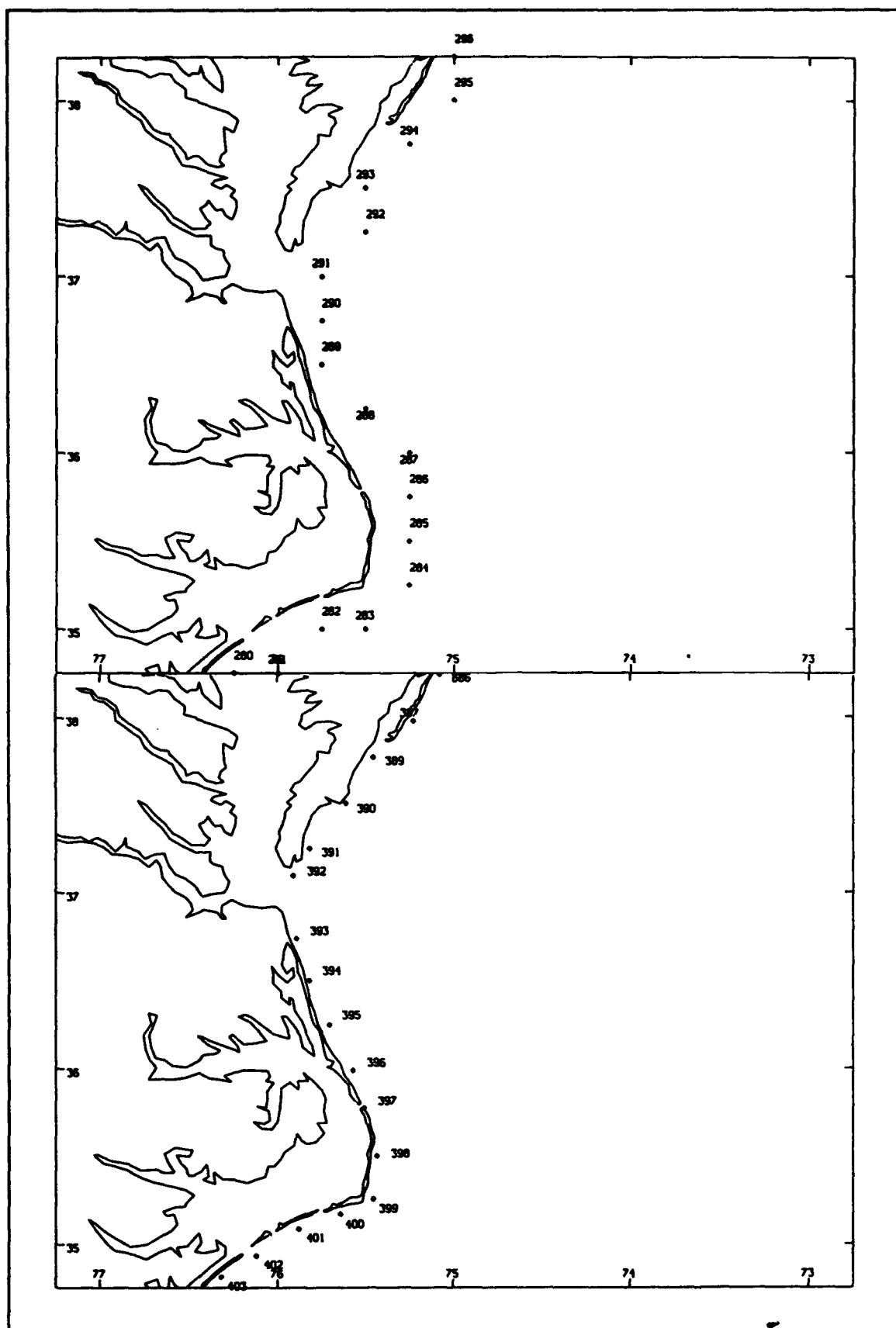
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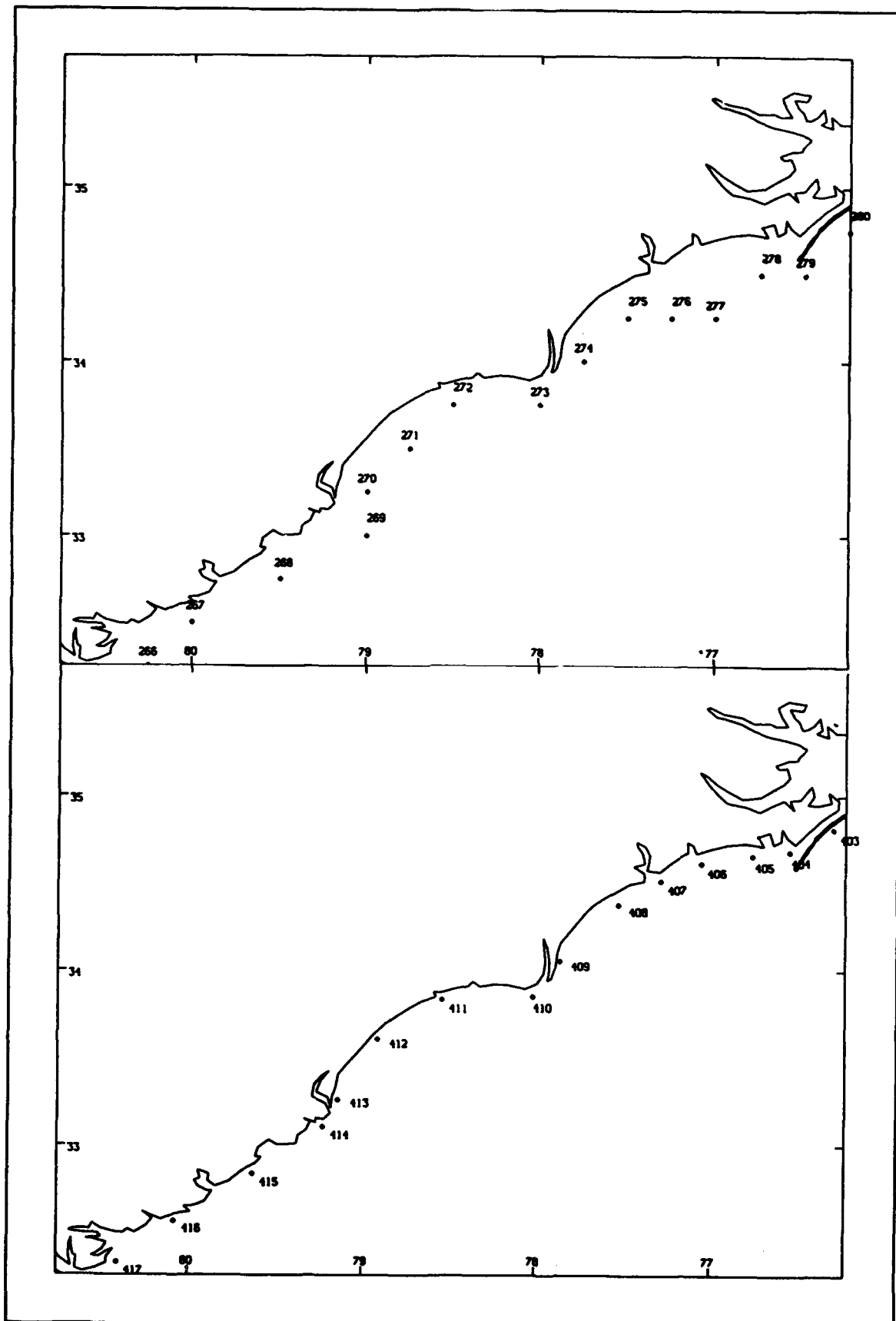
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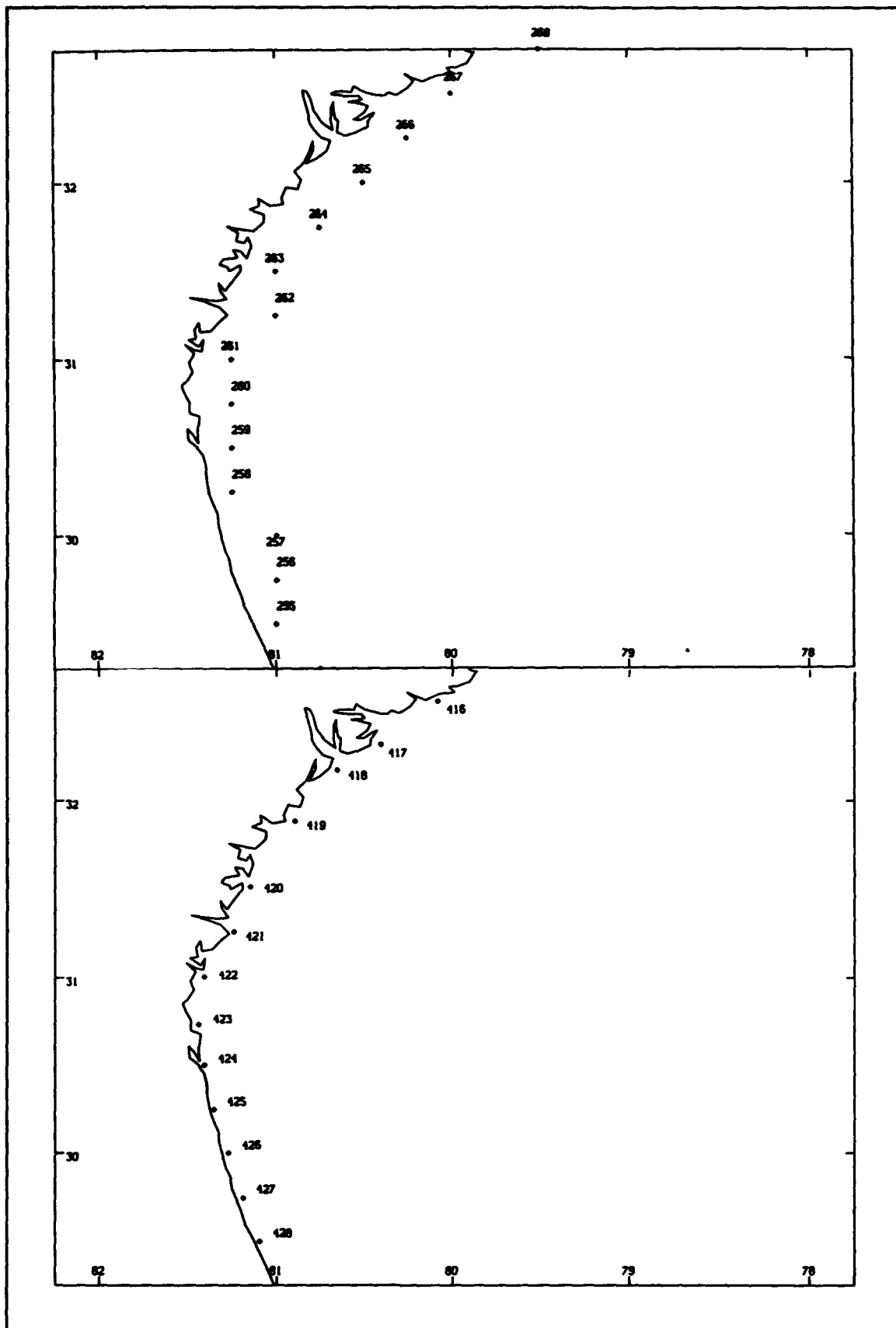
Appendix A Storm Surge Database Locations

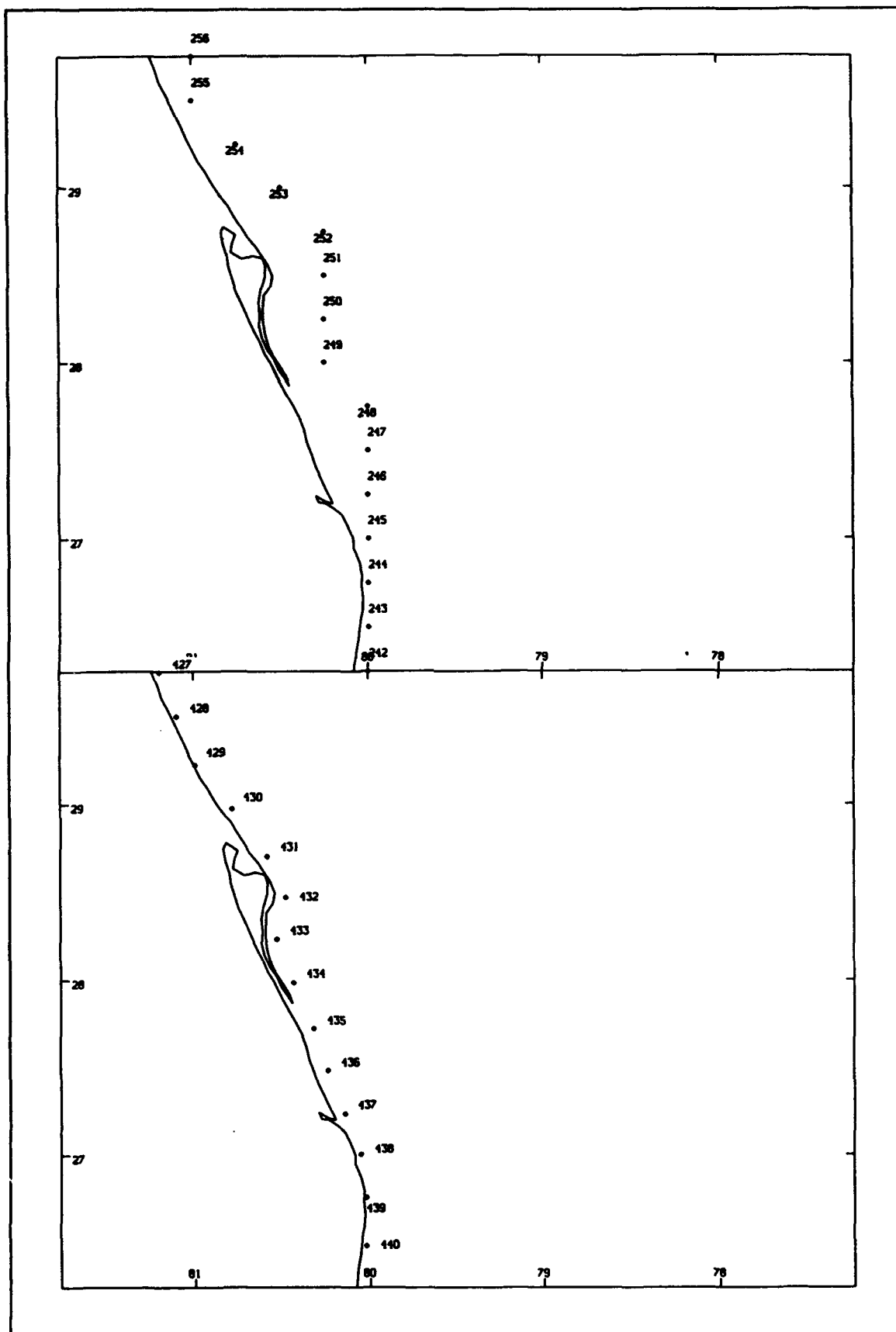


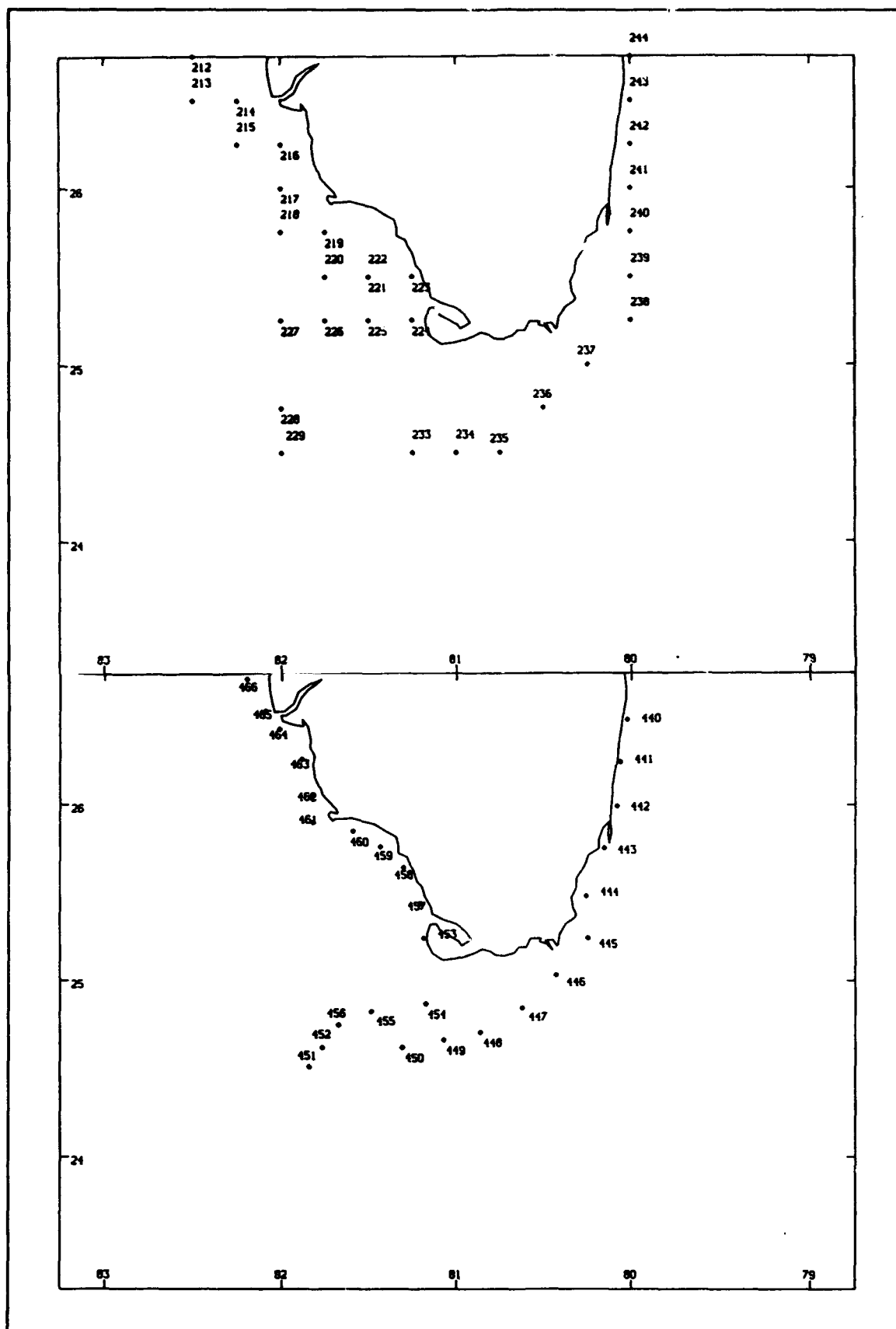


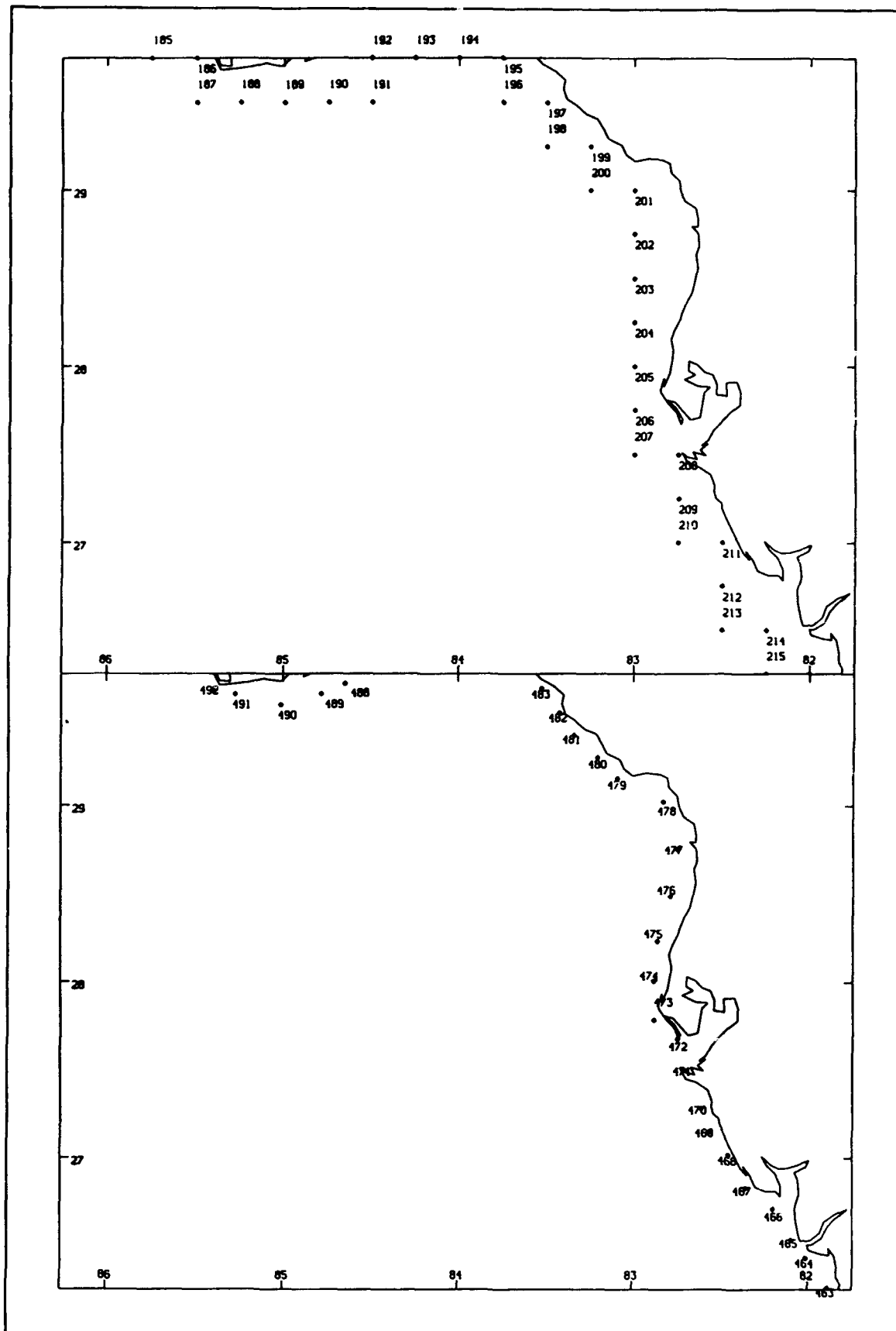


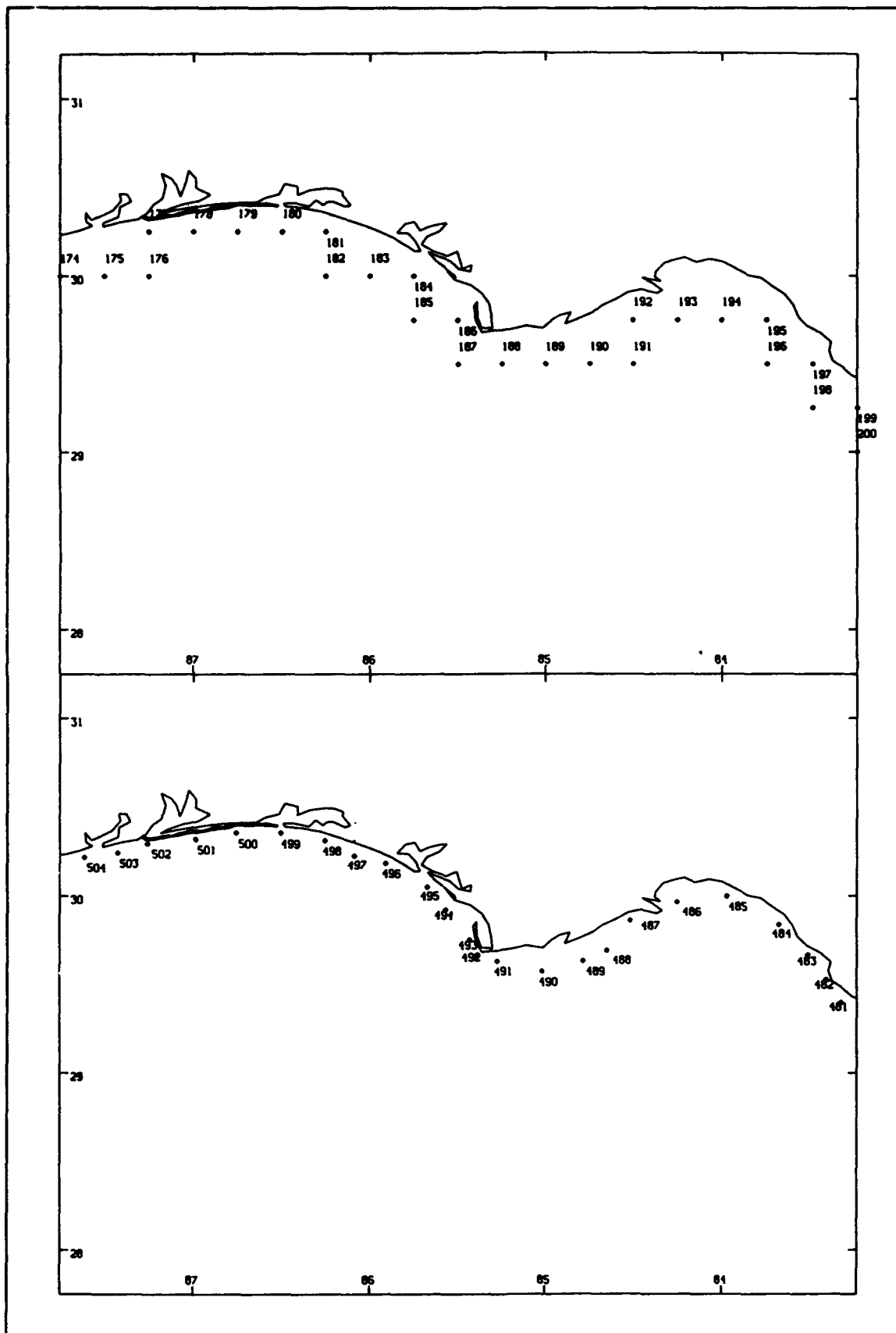


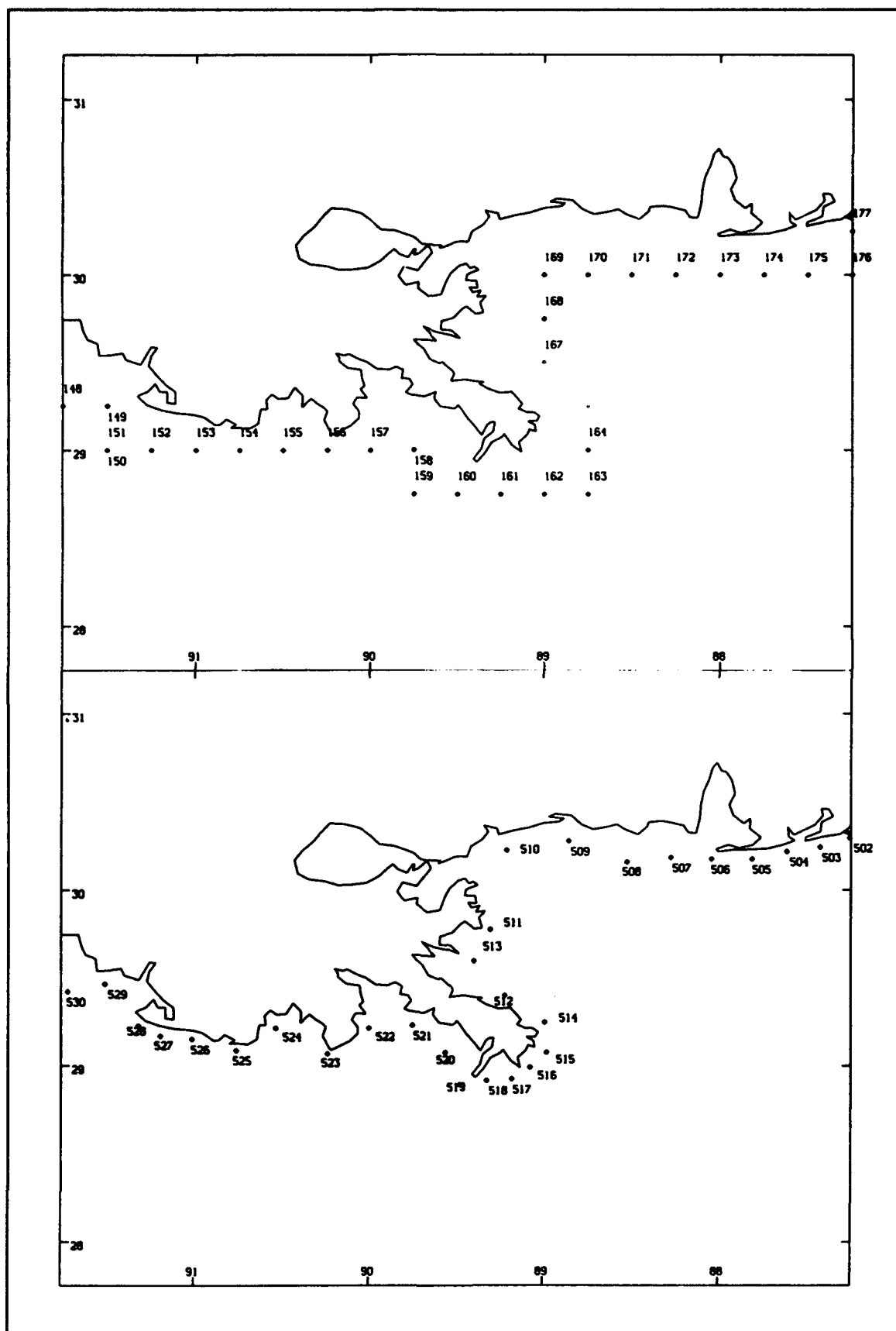


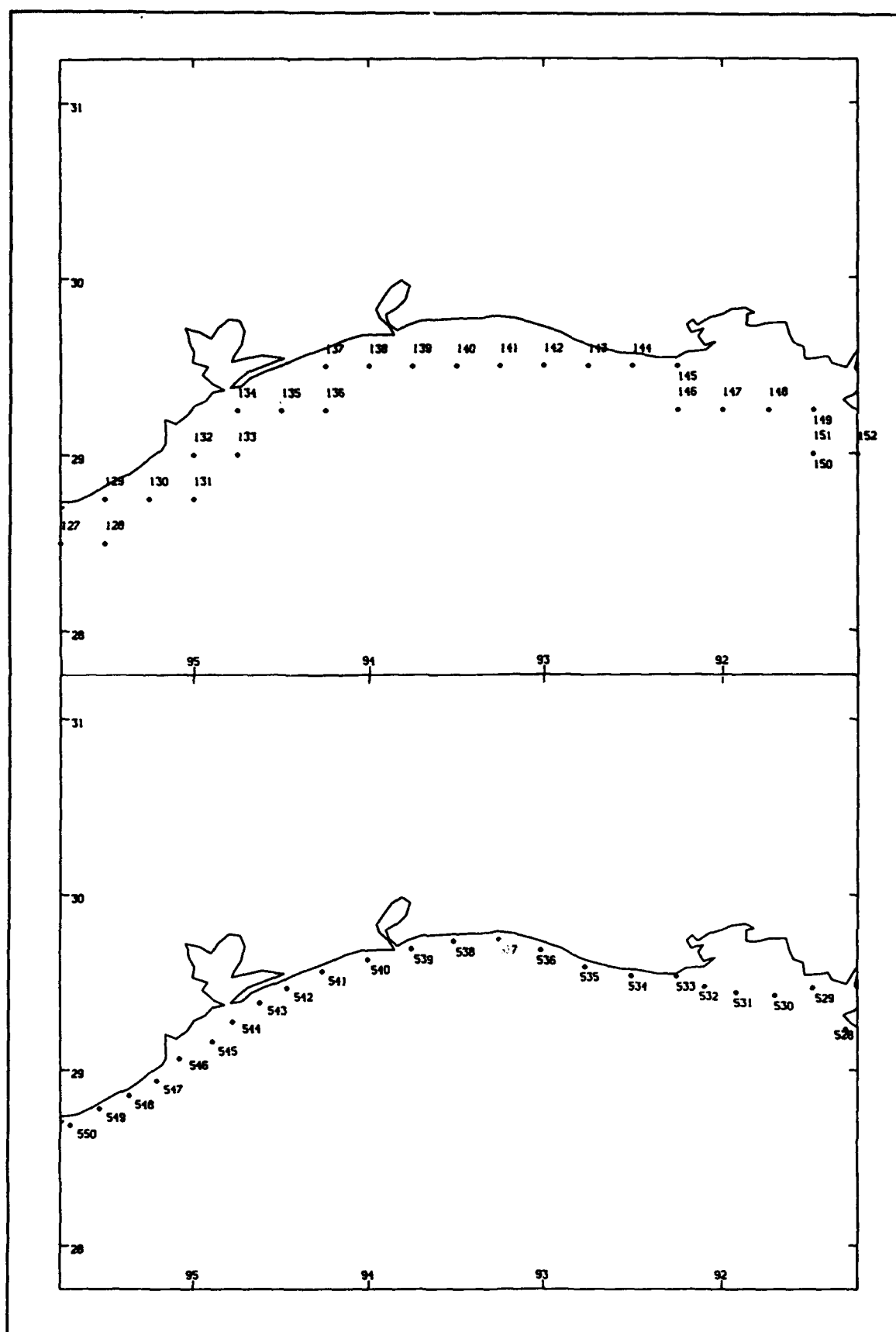


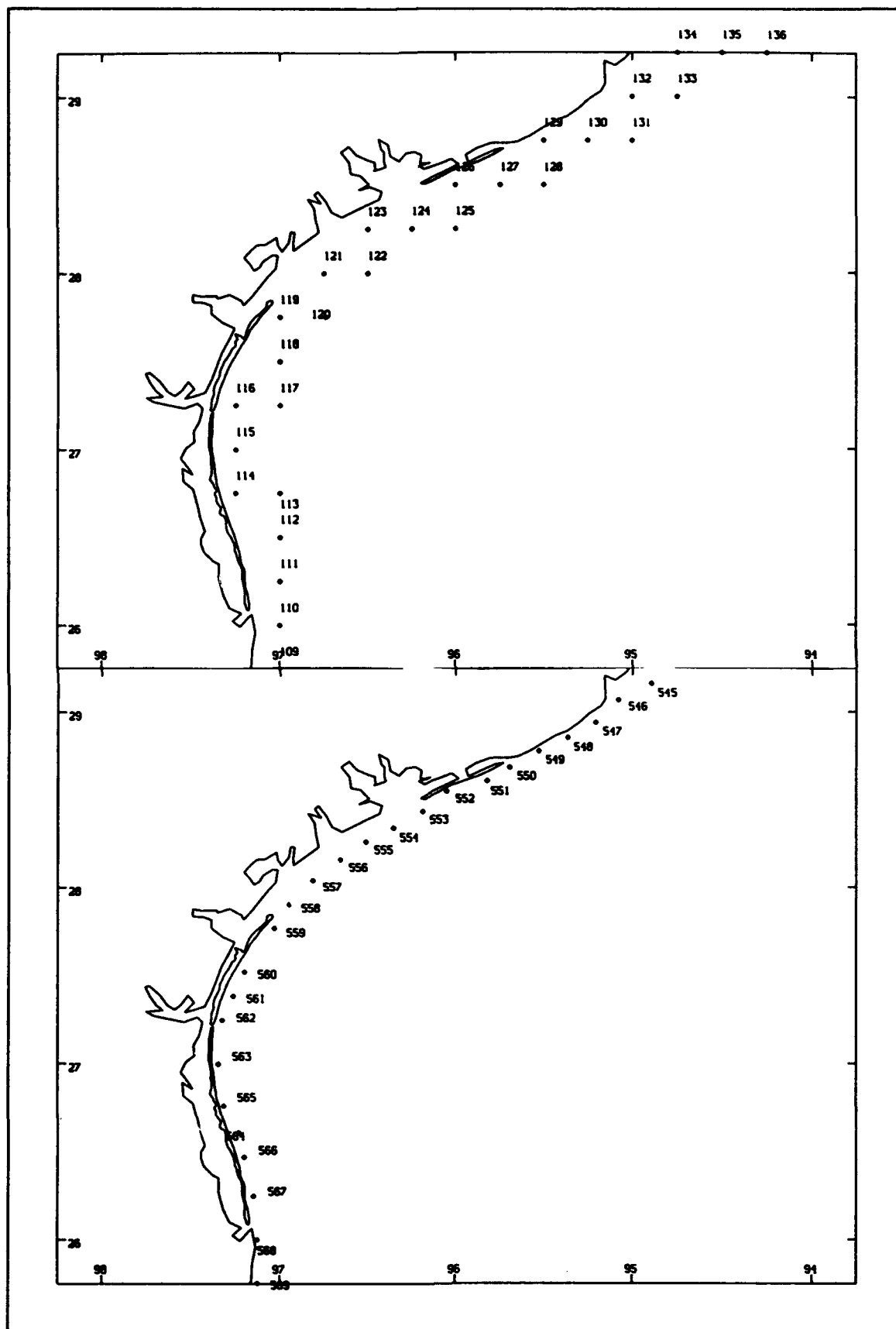


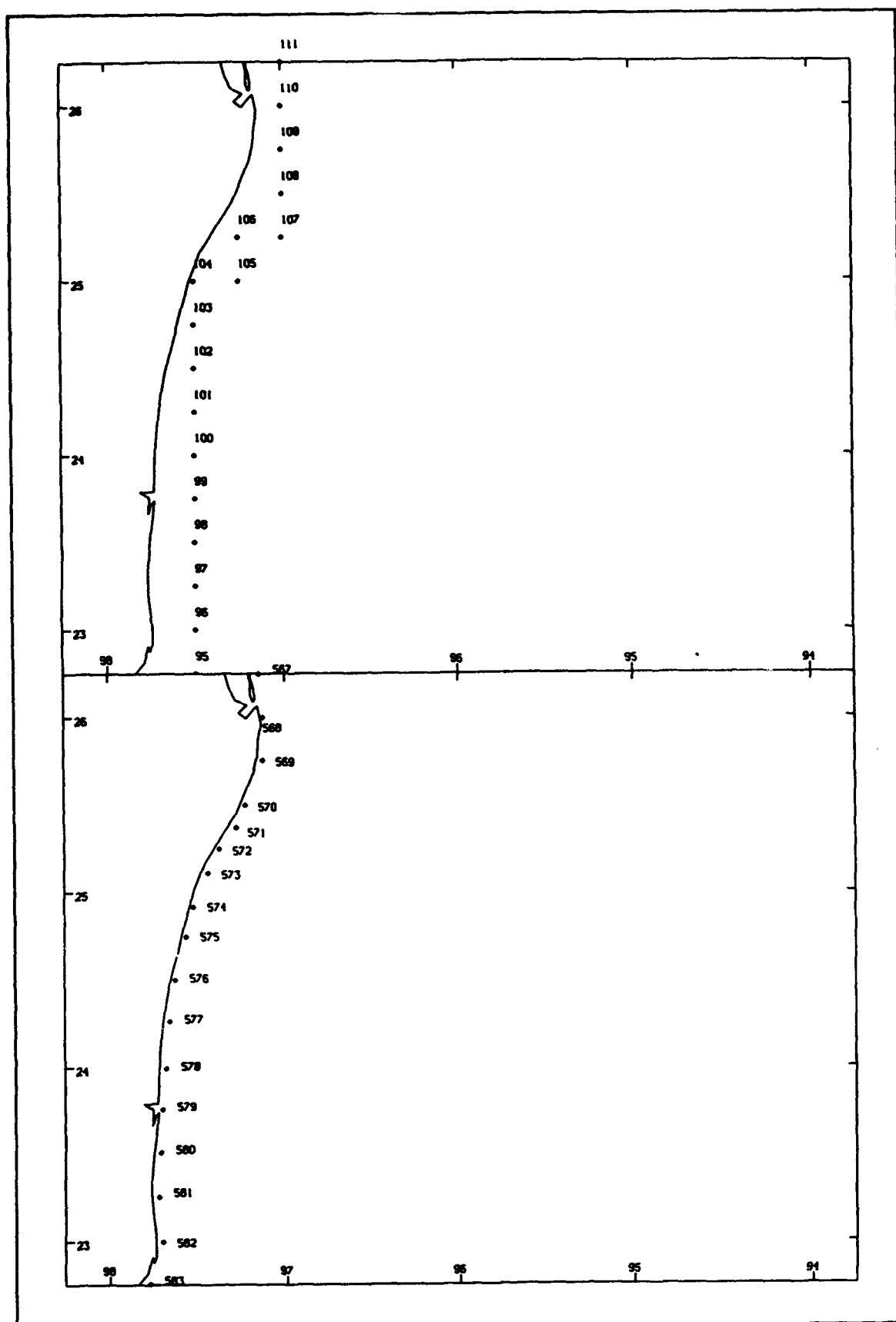












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25	-87.50000	21.75000	0.54216	7.23279	85	-97.00000	20.75000	0.58227	61.88559
26	-87.75000	21.75000	0.54435	13.77810	86	-97.00000	21.00000	0.58033	151.33736
27	-88.00000	21.75000	0.55802	14.83806	87	-97.25000	21.00000	0.58548	19.88351
28	-88.25000	21.75000	0.56348	6.72621	88	-97.25000	21.25000	0.58300	38.19778
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38	-90.25000	21.25000	0.62694	9.16971	98	-97.50000	23.50000	0.57556	73.80377
39	-90.50000	21.25000	0.63783	17.75780	99	-97.50000	23.75000	0.57585	49.56217
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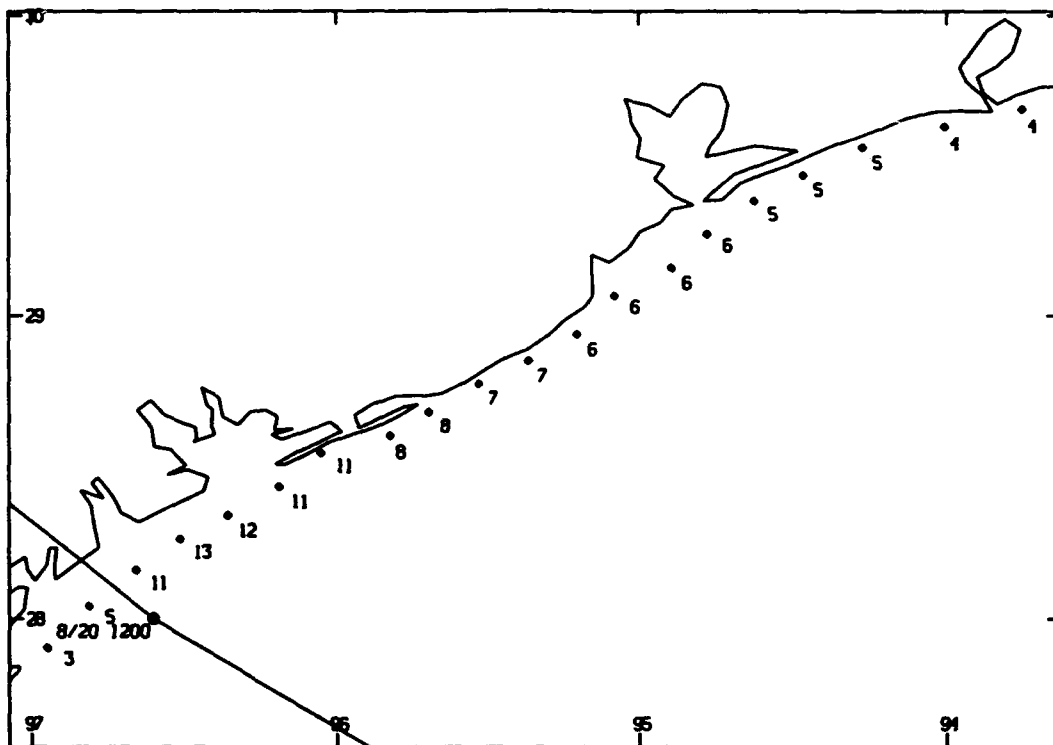
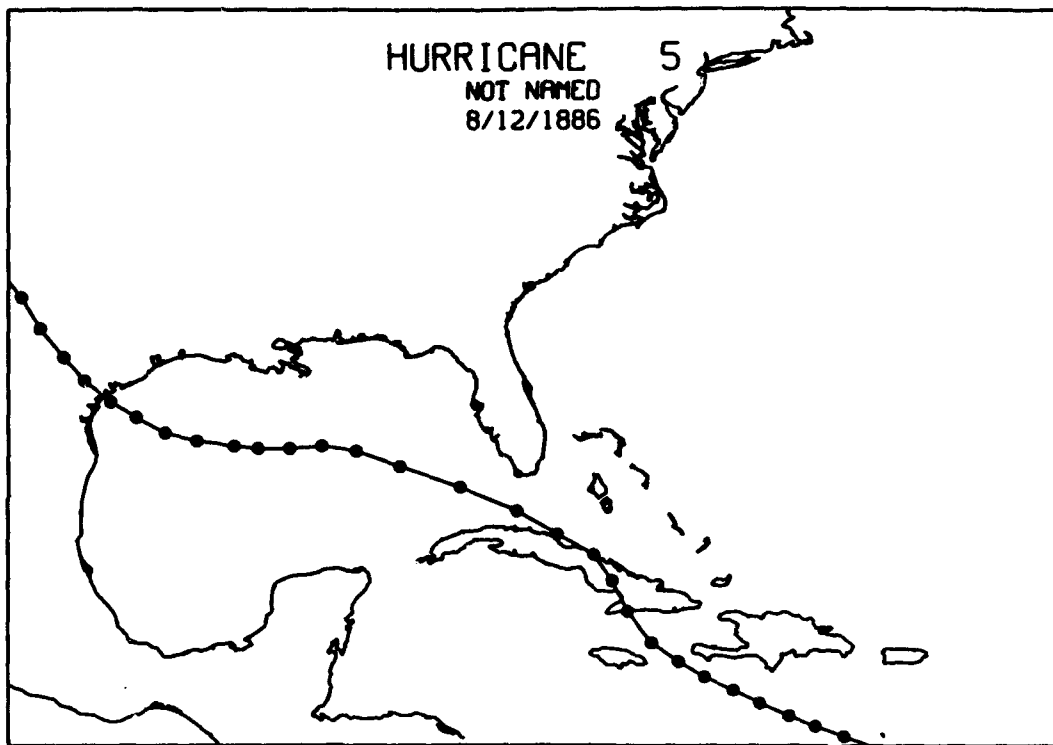
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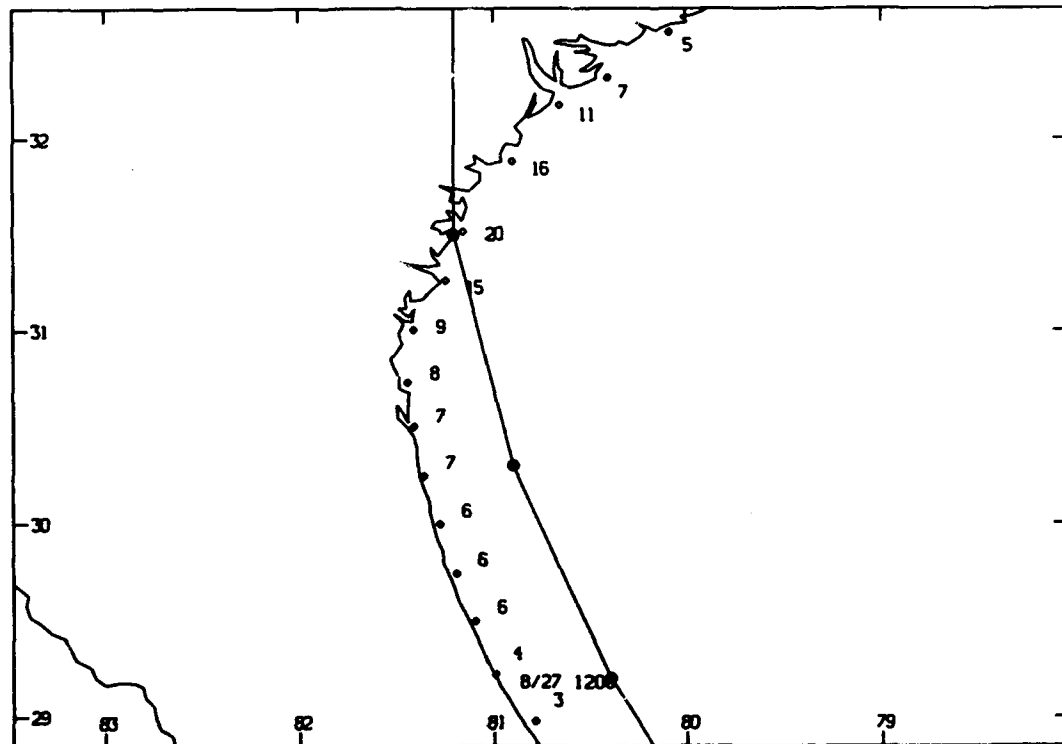
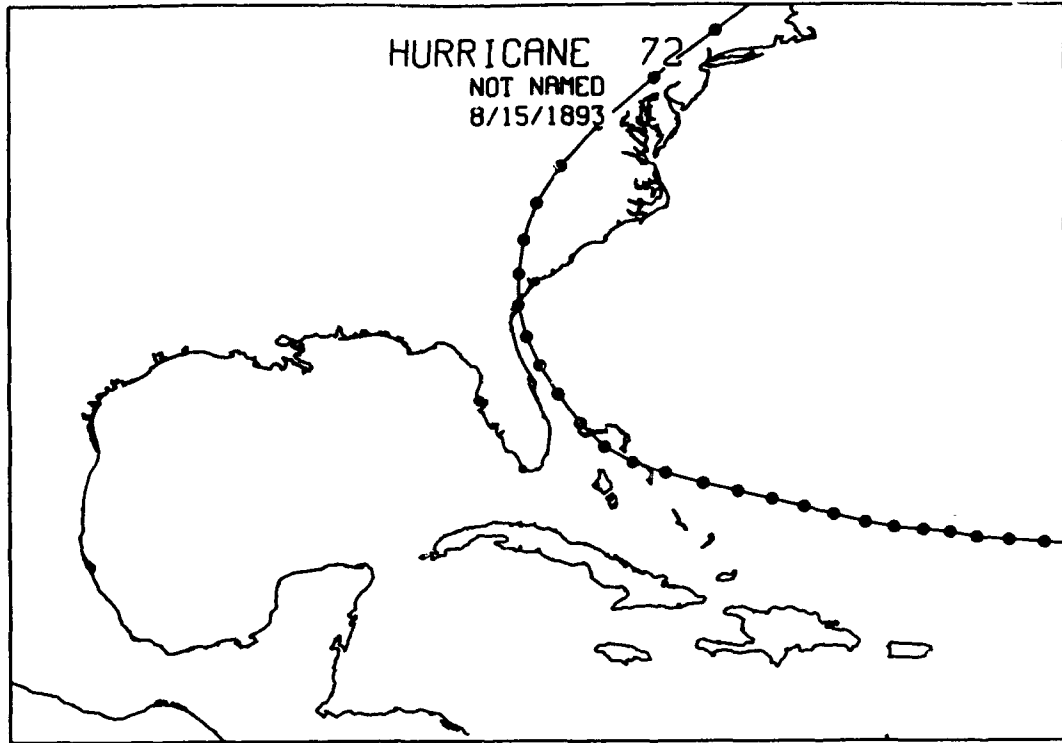
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374	-73.26160	40.66260	1.30182	8.34313	434	-80.44040	27.98470	1.08134	4.81430
375	-73.50150	40.61150	1.35915	7.22882	435	-80.32560	27.73020	1.04525	11.94174
376	-73.75190	40.55170	1.43862	6.31868	436	-80.26220	27.48130	1.06766	19.53987
377	-73.93660	40.23660	1.35258	23.44222	437	-80.14830	27.23380	0.97442	23.18322
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379	-74.05440	39.74970	1.23222	7.71691	439	-80.02310	26.75600	0.91264	132.11141
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384	-74.72400	39.00910	1.24581	13.28891	444	-80.26090	25.48170	0.73199	40.32579
385	-75.05780	38.75310	1.16603	13.82566	445	-80.23050	25.24280	0.69759	68.16329
386	-75.07870	38.24110	1.09034	17.20496	446	-80.42780	25.02950	0.67924	51.07578
387	-75.22470	37.97660	1.14572	11.34994	447	-80.62600	24.84180	0.65247	53.49263
388	-75.02660	38.56540	1.12914	6.96878	448	-80.86600	24.70520	0.62726	63.88128
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390	-75.61070	37.50730	1.28414	15.27416	450	-81.31450	24.61990	0.59135	22.00093
391	-75.81930	37.25140	1.33677	9.48430	451	-81.84650	24.50900	0.54742	63.87351
392	-75.91320	37.09780	1.27196	10.08260	452	-81.77350	24.61990	0.61826	7.09301
393	-75.89230	36.73940	1.24851	9.09746	453	-81.18930	25.24280	0.99856	6.22511
394	-75.81930	36.50050	1.18831	18.39321	454	-81.17890	24.86740	0.65591	10.00000
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398	-75.43340	35.50220	0.94772	18.02835	458	-81.30410	25.64380	1.24792	9.73998
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400	-75.64200	35.16940	1.04183	10.70924	460	-81.59610	25.84860	1.20375	6.44800
401	-75.88190	35.08410	1.04338	8.88613	461	-81.82560	25.89980	1.11403	7.35192
402	-76.12180	34.93050	1.02663	12.58570	462	-81.83610	26.04480	1.09211	7.75943
403	-76.32000	34.81110	1.03526	14.33101	463	-81.88820	26.25810	1.07346	7.00047
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410	-78.01820	33.84860	1.36435	4.98439	470	-82.60800	27.28200	0.82493	6.51408
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414	-79.22820	33.10630	1.40213	5.93698	474	-82.87920	28.00730	0.86959	4.82782
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416	-80.08360	32.56020	1.62767	4.83498	476	-82.78530	28.48510	1.05428	4.70247
417	-80.40700	32.32130	1.79601	5.07766	477	-82.74360	28.74960	1.14155	4.22868
418	-80.65730	32.17630	1.91974	7.38852	478	-82.82700	29.02270	1.18406	4.00000
419	-80.89930	31.88400	1.97525	7.48781	479	-83.08780	29.15070	1.06982	4.42390
420	-81.14970	31.51710	1.97759	4.62982	480	-83.20250	29.27010	1.00185	6.57466

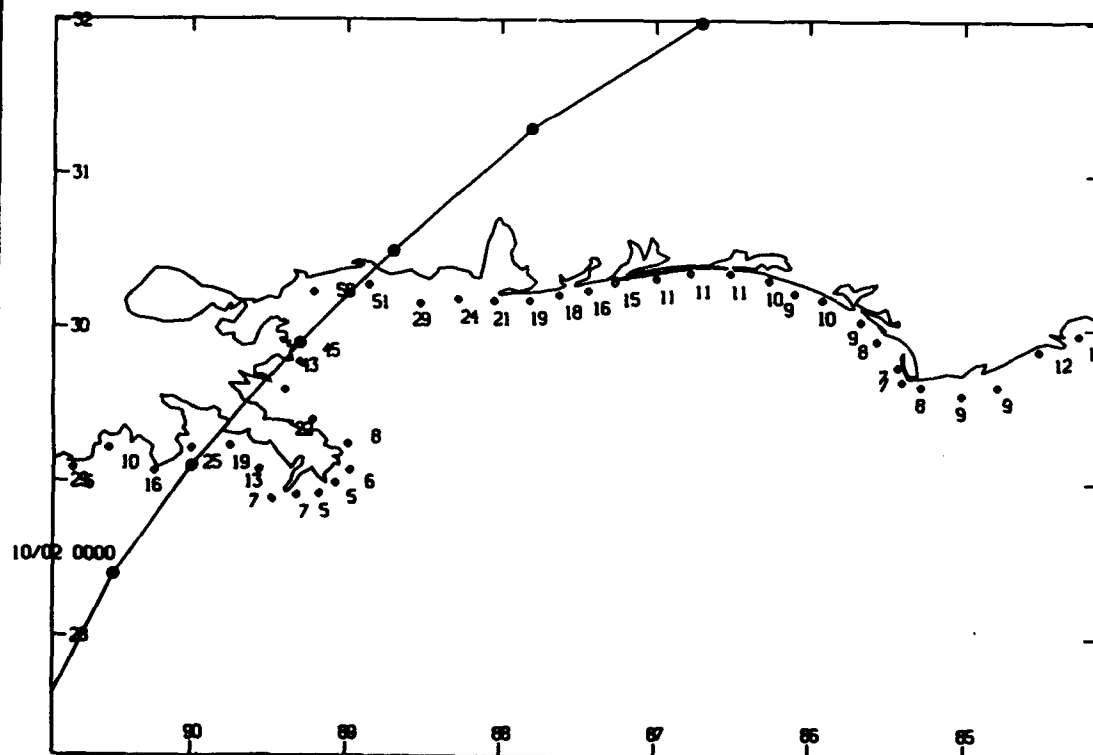
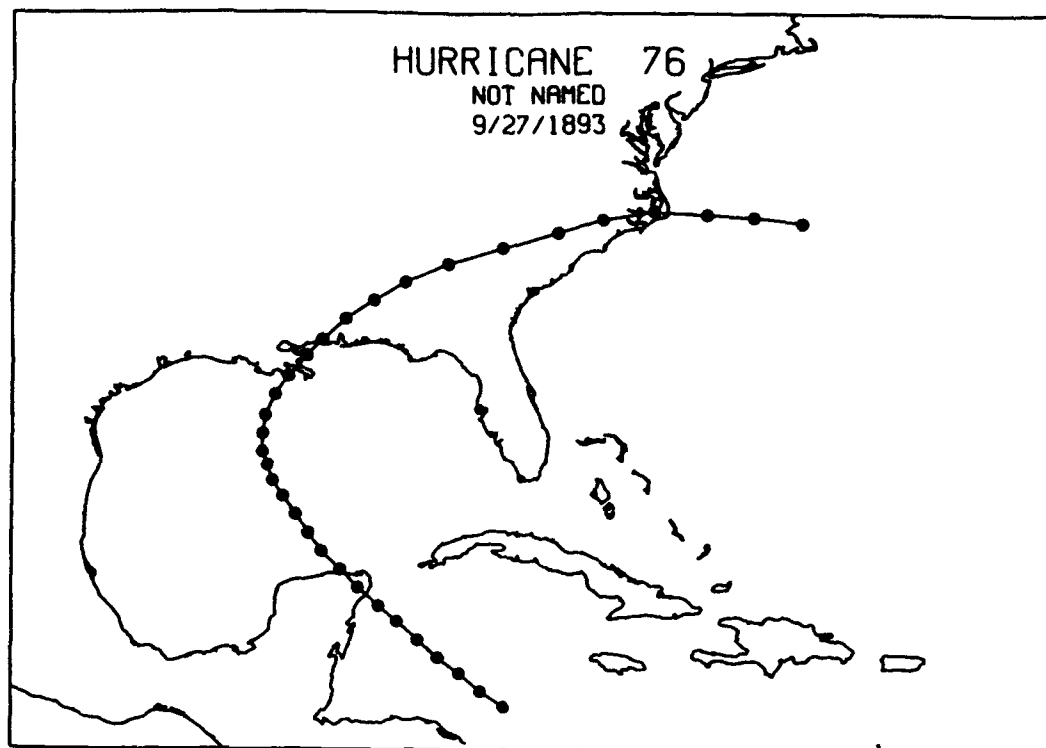
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485	-83.97240	29.99890	0.97321	4.17113	545	-94.89390	29.15830	0.68577	5.96351
486	-84.25600	29.96420	0.92165	4.00000	546	-95.08160	29.06450	0.64670	6.22300
487	-84.51480	29.86180	0.77337	4.90797	547	-95.20680	28.93630	0.62196	8.32424
488	-84.63040	29.69120	0.66064	9.17065	548	-95.36330	28.85120	0.60290	7.46256
489	-84.78600	29.63130	0.60235	7.71686	549	-95.53020	28.77440	0.58953	7.05370
490	-85.01330	29.57170	0.47848	10.21824	550	-95.67710	28.68050	0.58449	9.95738
491	-85.27630	29.63130	0.43007	10.62268	551	-95.82220	28.60370	0.58211	8.89722
492	-85.40130	29.65710	0.43588	10.82530	552	-96.03170	28.54400	0.58339	5.60321
493	-85.43270	29.73090	0.44577	13.28019	553	-96.18730	28.43310	0.58360	7.79448
494	-85.56890	29.92160	0.47090	8.65476	554	-96.35420	28.33920	0.58640	6.46372
495	-85.67270	30.04930	0.47357	16.73947	555	-96.51070	28.26240	0.58935	9.86670
496	-85.91260	30.18610	0.48170	11.67493	556	-96.65670	28.16000	0.59122	6.51313
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498	-86.25680	30.31410	0.48264	15.80560	558	-96.96880	27.90410	0.59504	11.36989
499	-86.50720	30.35670	0.48223	7.46859	559	-97.03230	27.76750	0.59481	11.41375
500	-86.75730	30.35670	0.47989	4.00000	560	-97.20130	27.51710	0.59616	16.56866
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505	-87.81110	30.17750	0.48915	7.19430	565	-97.31600	26.75770	0.59038	9.34019
506	-88.04060	30.17750	0.50807	9.62408	566	-97.20130	26.46760	0.58451	15.36964
507	-88.27000	30.18610	0.51331	11.14936	567	-97.14910	26.24580	0.58057	10.27488
508	-88.52040	30.16050	0.52077	11.38761	568	-97.12820	25.99830	0.57528	17.70817
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515	-88.97940	29.07680	0.44148	65.54721	575	-97.56630	24.74410	0.58176	17.62198
516	-89.07320	28.99150	0.44131	49.61383	576	-97.62890	24.49660	0.58158	14.53671
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522	-90.00160	29.21340	0.46487	6.98934	582	-97.70200	22.99490	0.58284	10.00000
523	-90.24150	29.06830	0.47008	9.18662	583	-97.77500	22.75600	0.58943	10.00000
524	-90.53360	29.21340	0.50082	8.96870	584	-97.78540	22.48850	0.58980	10.00000
525	-90.76310	29.08540	0.51362	8.78566	585	-97.75410	22.24960	0.58867	10.00000
526	-91.01350	29.14980	0.53416	6.63064	586	-97.63940	21.99360	0.58478	9.85660
527	-91.19080	29.16690	0.58888	5.38724	587	-97.51420	21.82300	0.58188	24.13206
528	-91.31600	29.22660	0.62024	4.62138	588	-97.40990	21.69500	0.57950	43.45647
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530	-91.71230	29.42280	0.62417	4.00000	590	-97.37860	21.24280	0.58935	5.68672
531	-91.92100	29.43990	0.66267	4.00000	591	-97.28470	21.06360	0.58740	11.94729
532	-92.09830	29.47400	0.68786	4.43894	592	-97.18040	20.84170	0.58540	14.50605
533	-92.25480	29.53380	0.68941	4.14046	593	-97.11780	20.68820	0.58504	12.87444
534	-92.50510	29.53380	0.72280	6.21479	594	-97.00310	20.55160	0.58391	8.08001
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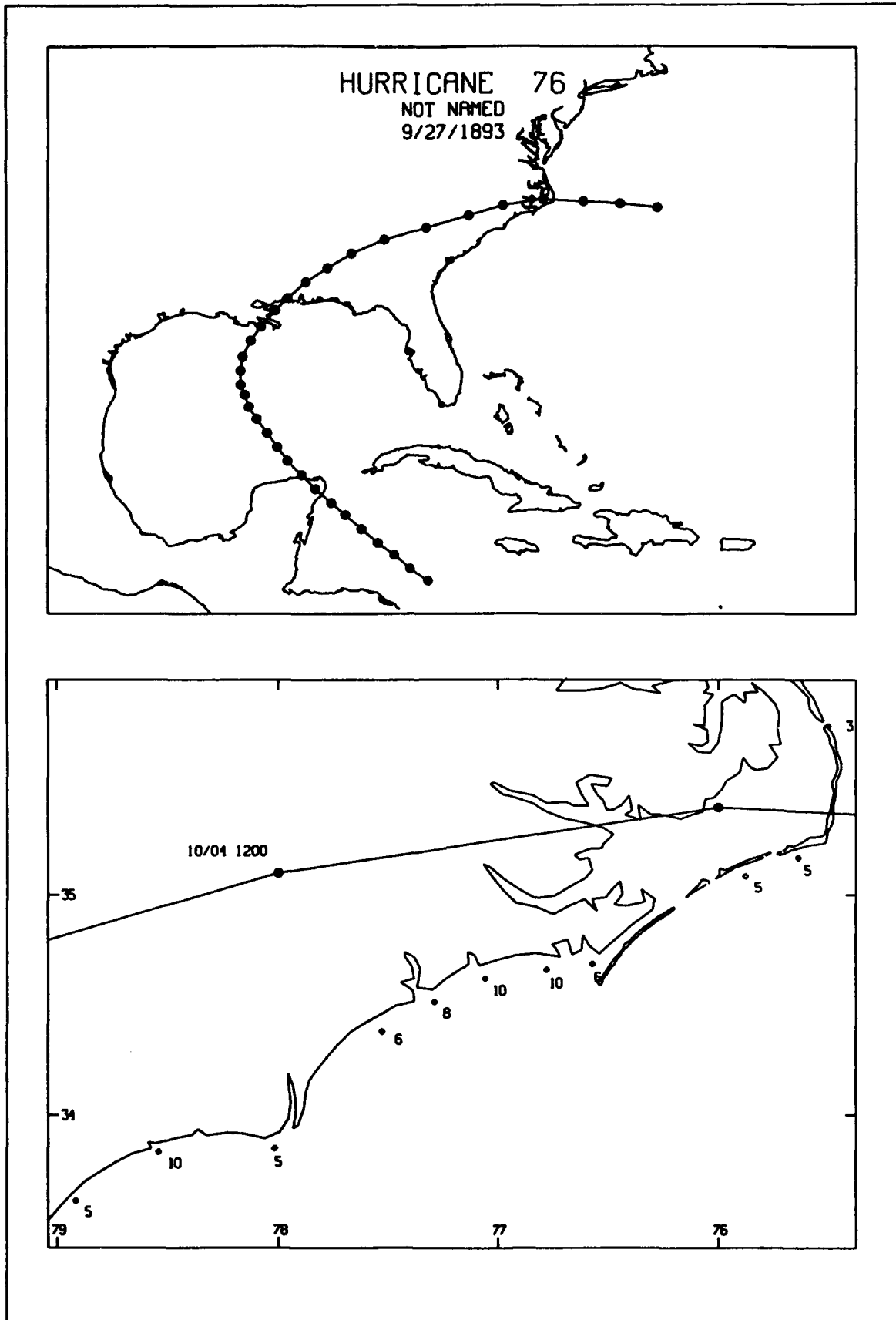
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604	-95.97870	19.07230	0.58546	10.00000	664	-87.18100	20.35240	0.23214	306.35775
605	-95.87440	18.91900	0.58646	6.28830	665	-87.26430	20.24150	0.23192	203.54039
606	-95.60320	18.80800	0.58142	13.85453	666	-87.32710	20.13910	0.23177	308.83932
607	-95.38410	18.76340	0.57895	12.72837	667	-87.43220	19.74660	0.23221	195.20707
608	-95.18590	18.73980	0.57708	35.37567	668	-87.33830	19.49920	0.23350	870.71967
609	-95.00860	18.64590	0.57744	13.92816	669	-87.42890	19.25170	0.23427	434.61507
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611	-94.68320	18.49820	0.58125	23.51054	671	-87.49400	18.98720	0.23520	649.70260
612	-94.56010	18.29610	0.58665	16.17870	672	-87.55630	18.81660	0.23589	415.54425
613	-94.29930	18.27030	0.58771	13.77297	673	-87.59830	18.65440	0.23763	144.47537
614	-93.99480	18.33020	0.58301	19.20938	674	-87.62960	18.53300	0.23894	358.63765
615	-93.74640	18.40700	0.58685	35.05365	675	-87.66090	18.40700	0.23956	843.86680
616	-93.53780	18.47530	0.57976	36.28874	676	-87.37920	19.98330	0.23181	378.43125
617	-93.31870	18.48380	0.58488	11.85975	677	-87.76520	18.24490	0.24013	773.95933
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620	-92.72420	18.65440	0.59435	6.35100	680	-85.33720	18.41810	0.43575	42.02773
621	-92.53640	18.69710	0.60171	3.67848	681	-85.60650	17.75710	0.19403	2067.98358
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623	-92.18170	18.73980	0.65601	5.74575	683	-87.08790	17.75710	0.20644	1207.13551
624	-91.96270	18.77390	0.74668	4.00000	684	-87.13530	17.15120	0.21693	4936.20115
625	-91.66020	18.54330	0.86515	10.00000	685	-86.48190	17.09610	0.21384	4717.23585
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629	-90.93000	19.28580	0.85081	5.37122					
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634	-90.58580	20.23300	0.85900	9.34357					
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636	-90.53360	20.73640	0.77164	4.76293					
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643	-89.65740	21.35070	0.58382	5.77973					
644	-89.46960	21.37630	0.58262	4.32783					
645	-89.22970	21.40190	0.57807	5.33363					
646	-88.98980	21.41900	0.58036	7.80404					
647	-88.61010	21.56400	0.59204	5.44933					
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650	-88.23460	21.62370	0.58454	6.62223					
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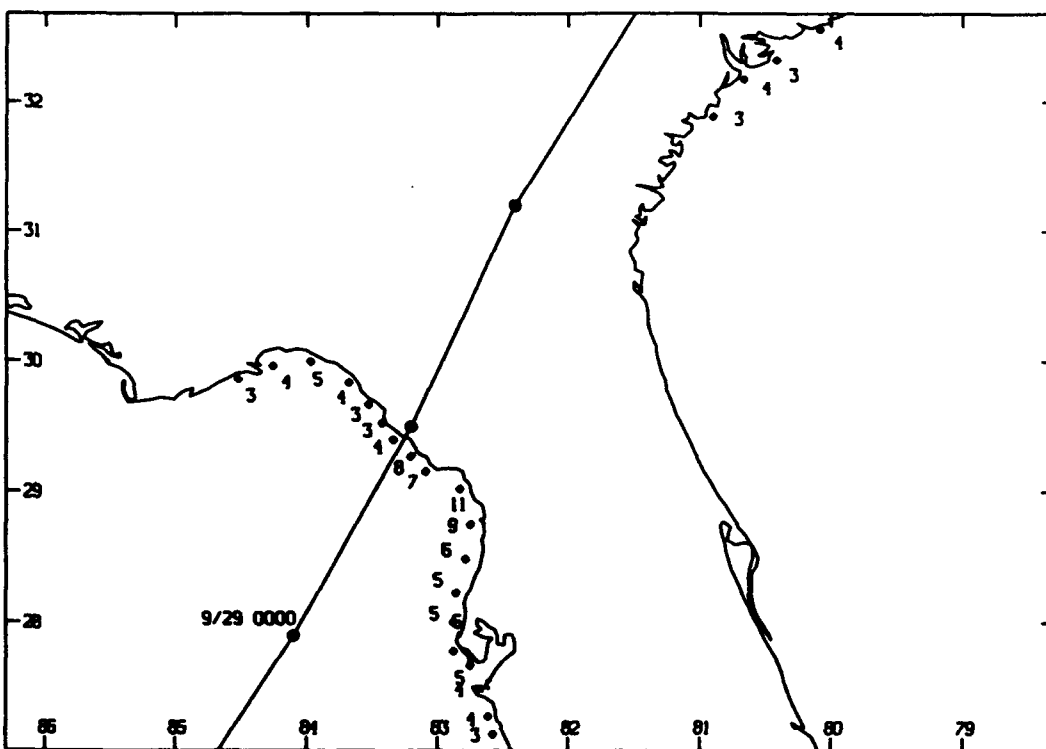
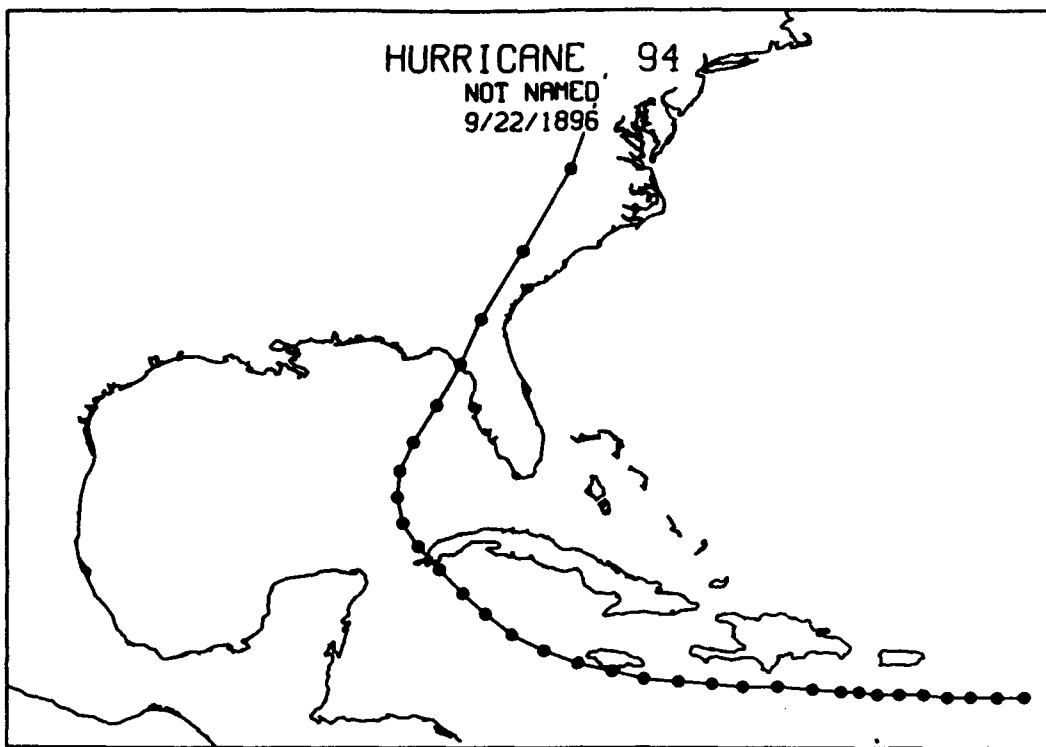
Appendix B Historic Storm Event Tracks and Simulated Maximum Surge Elevation

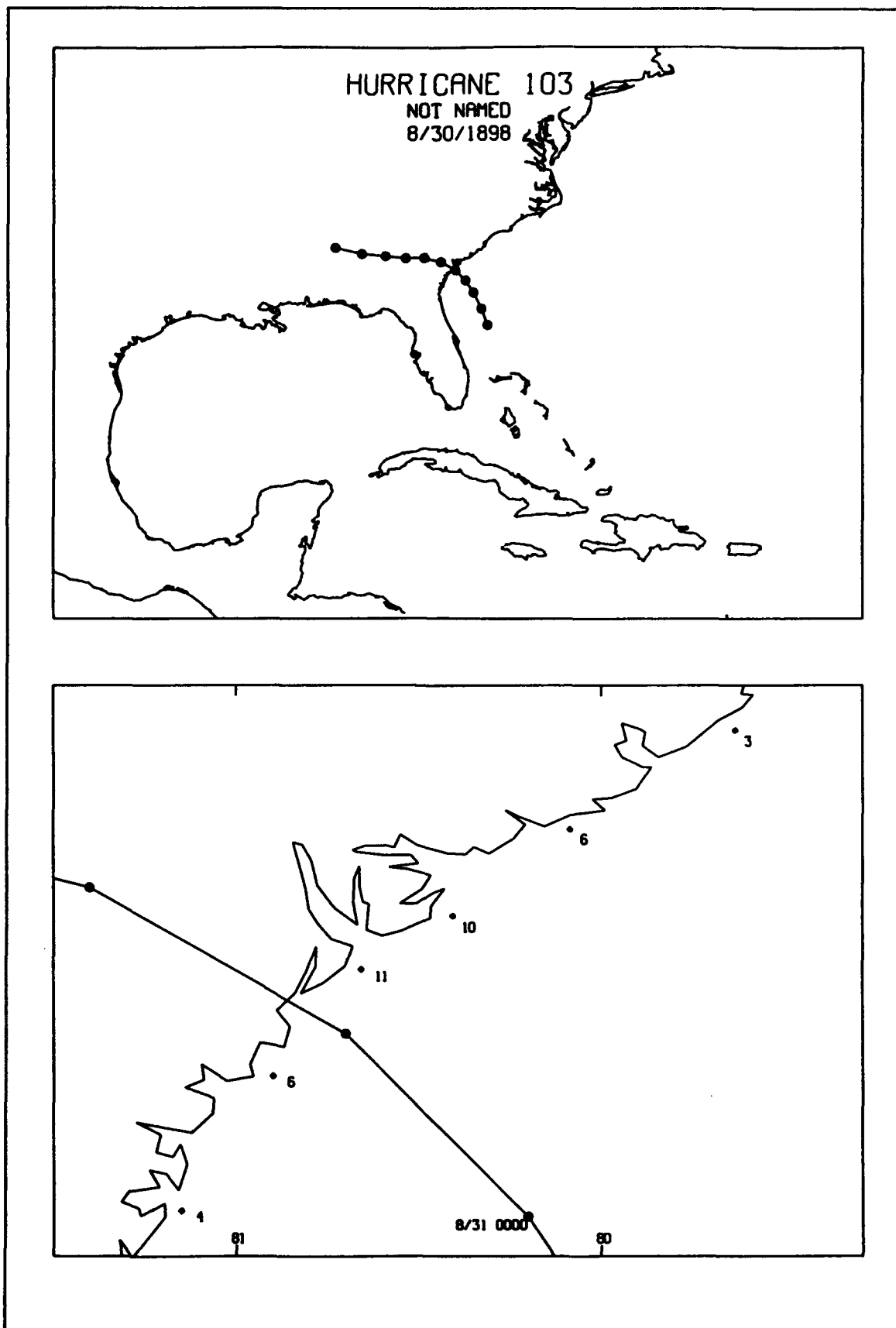


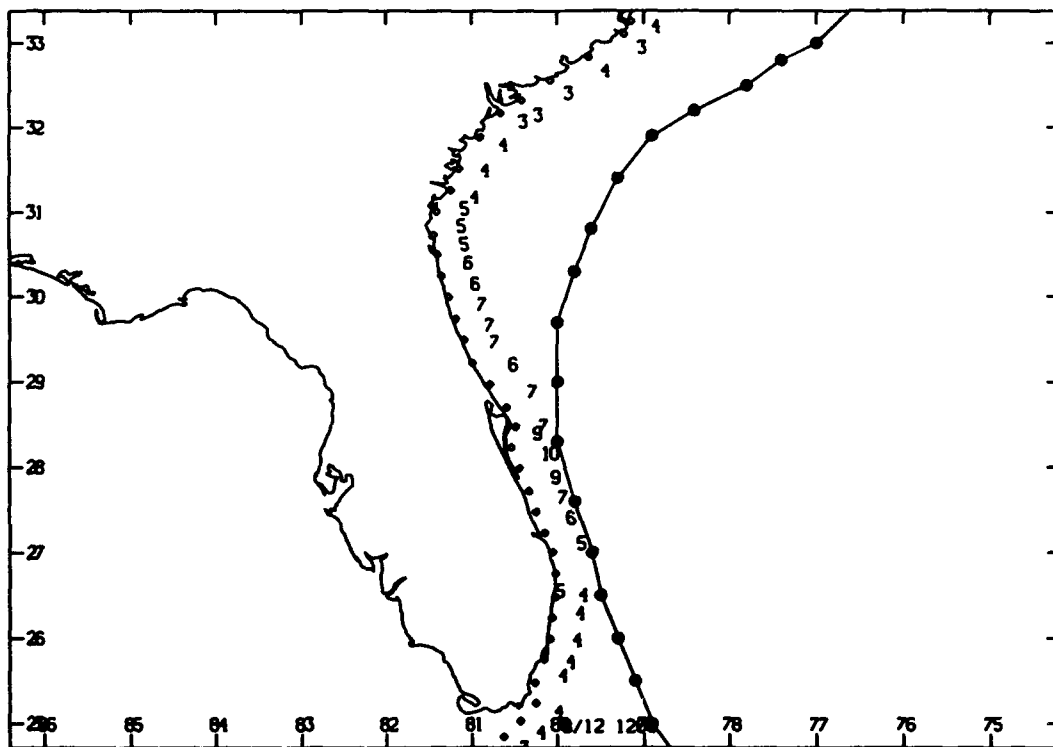
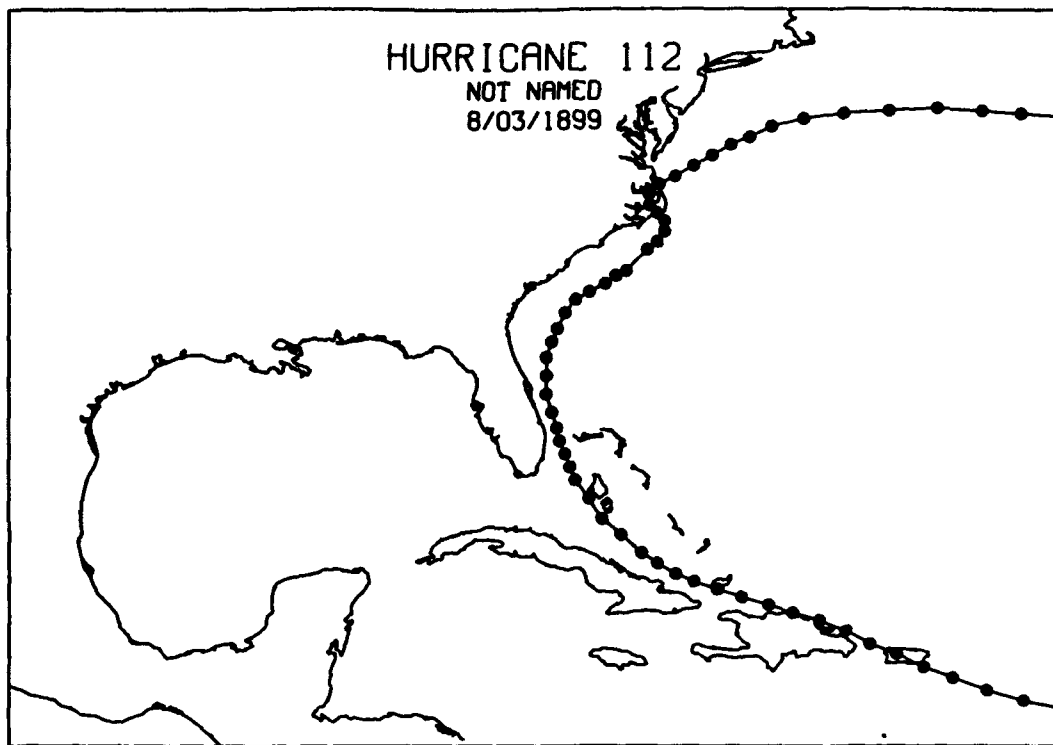


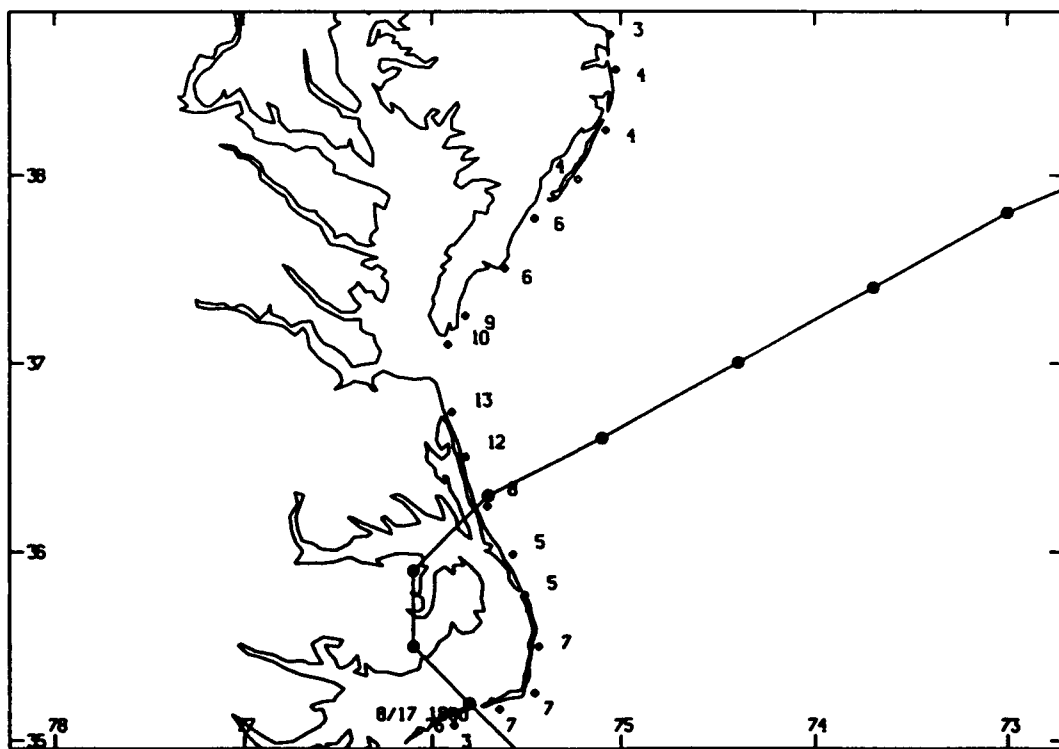
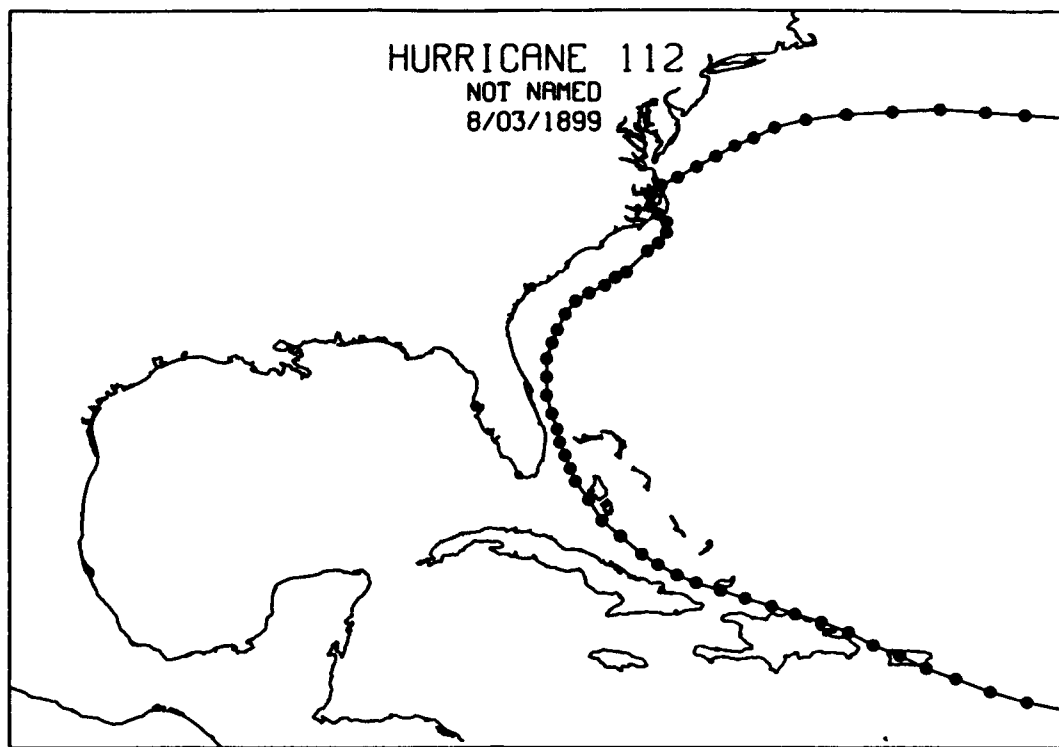


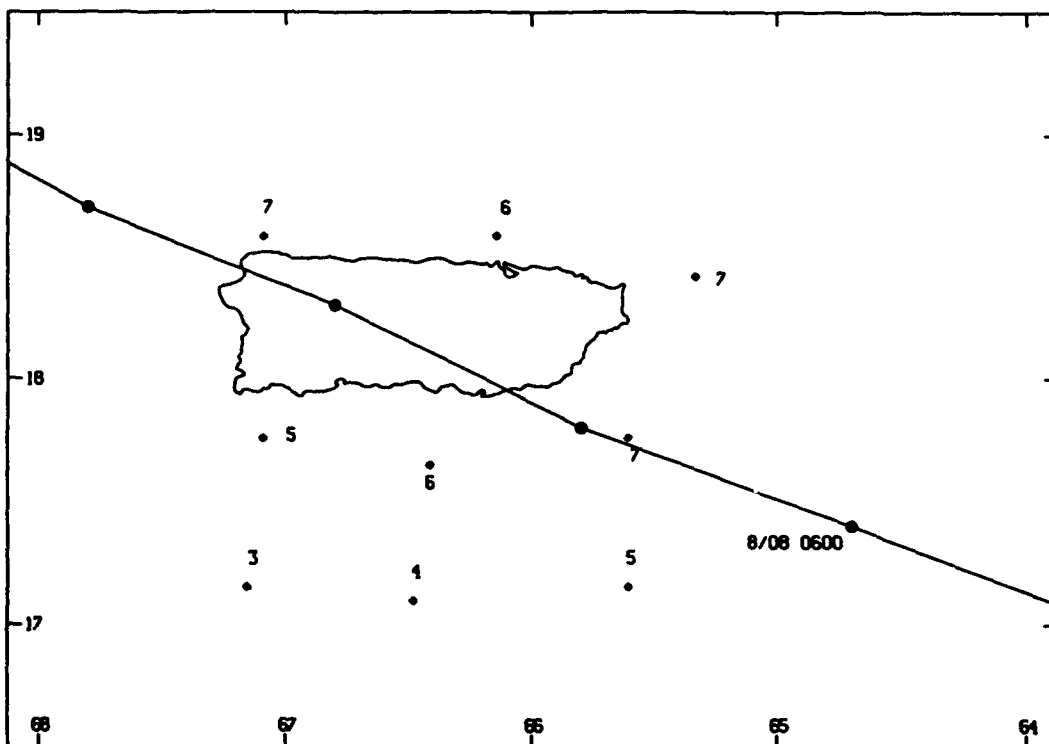
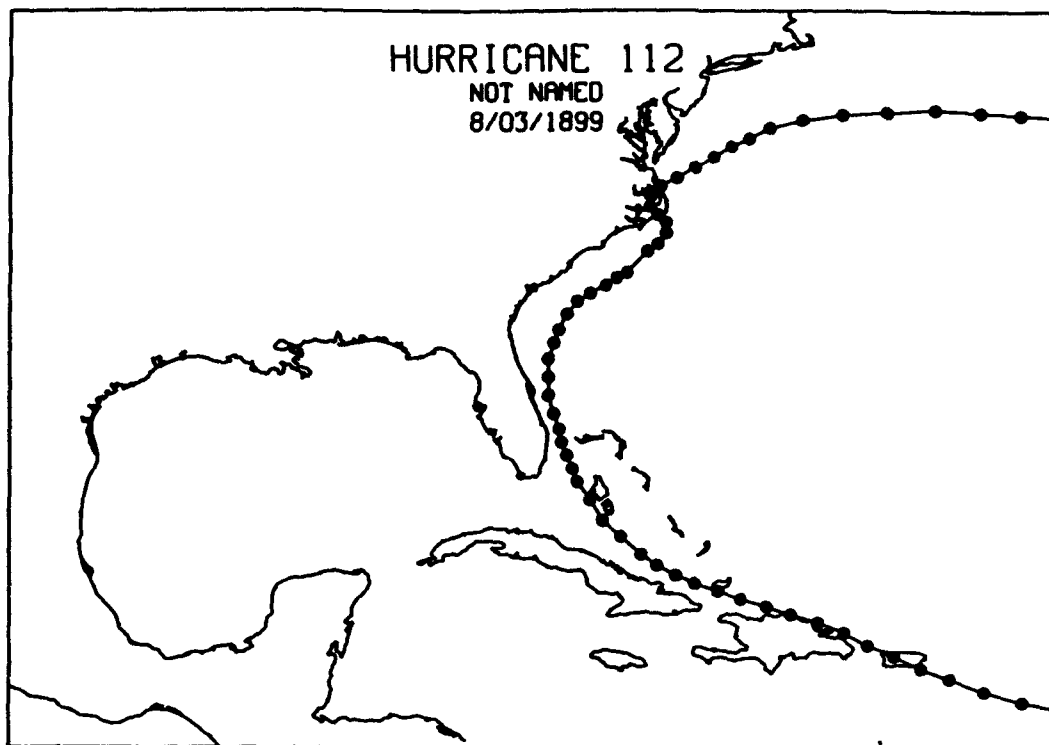


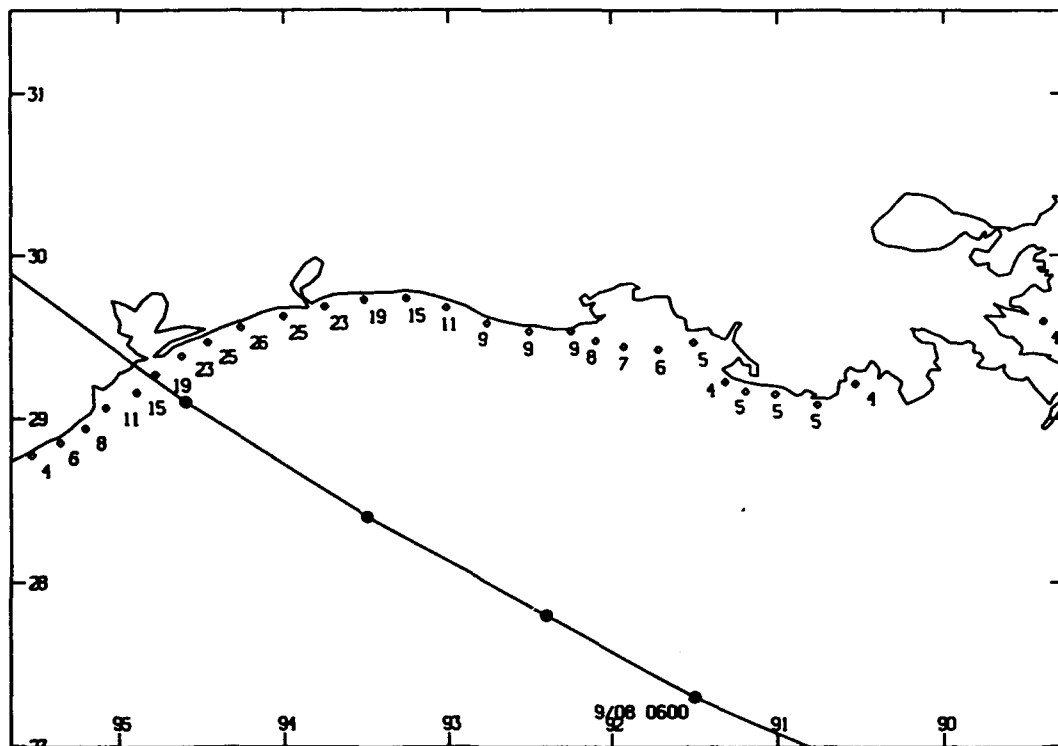
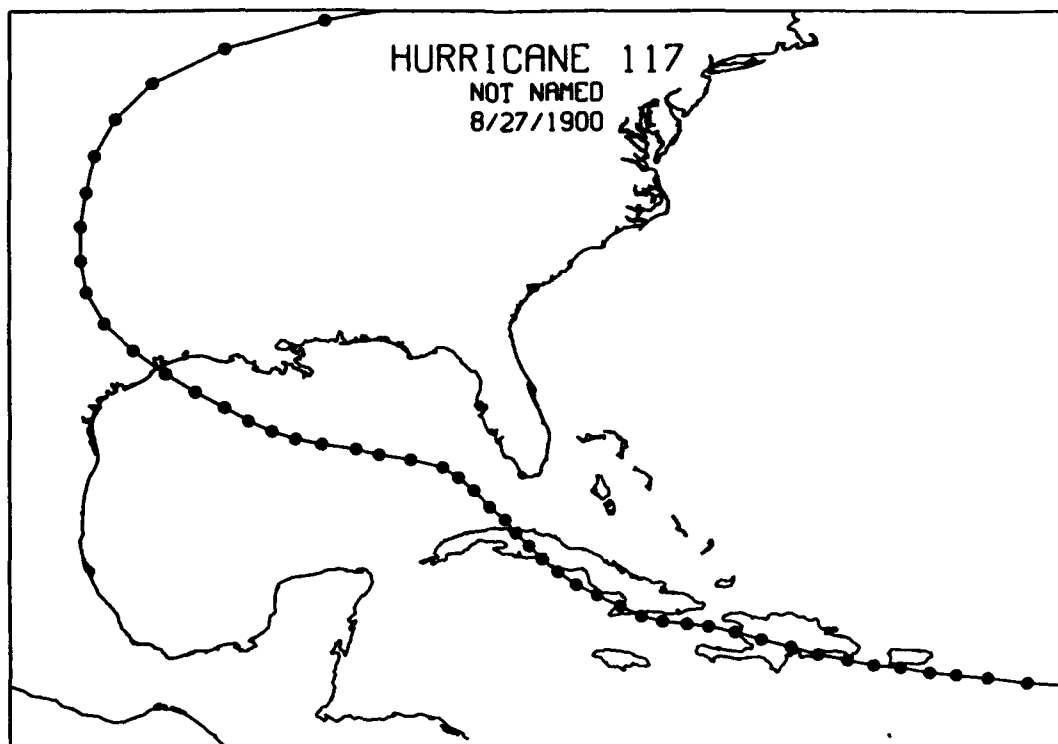


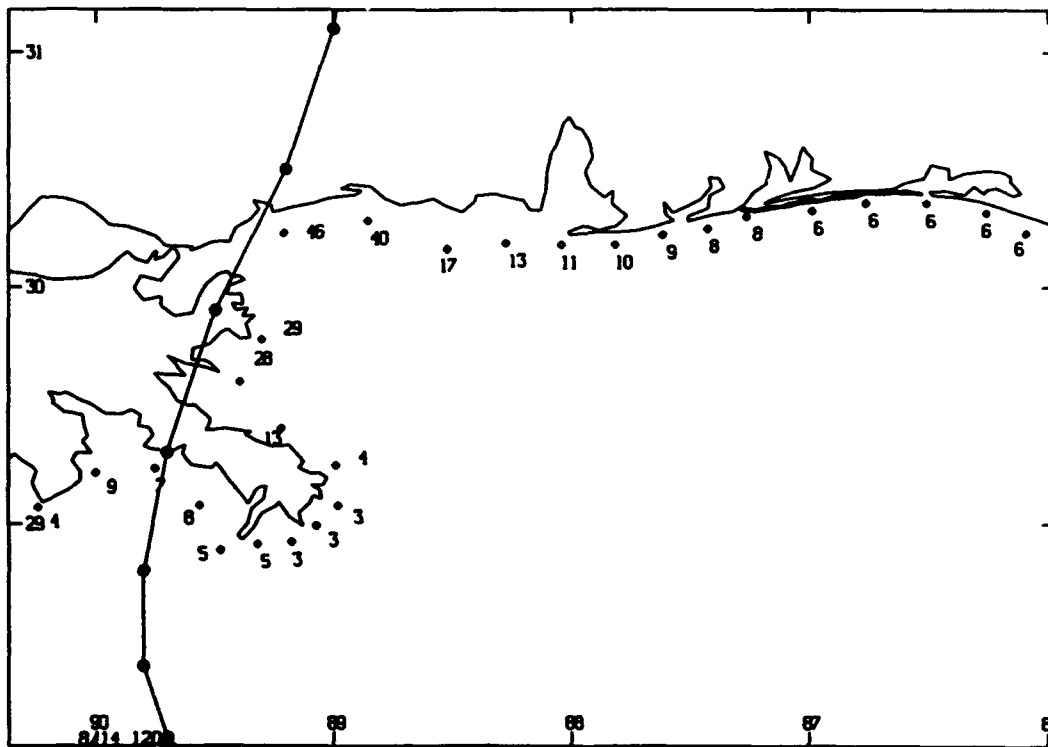
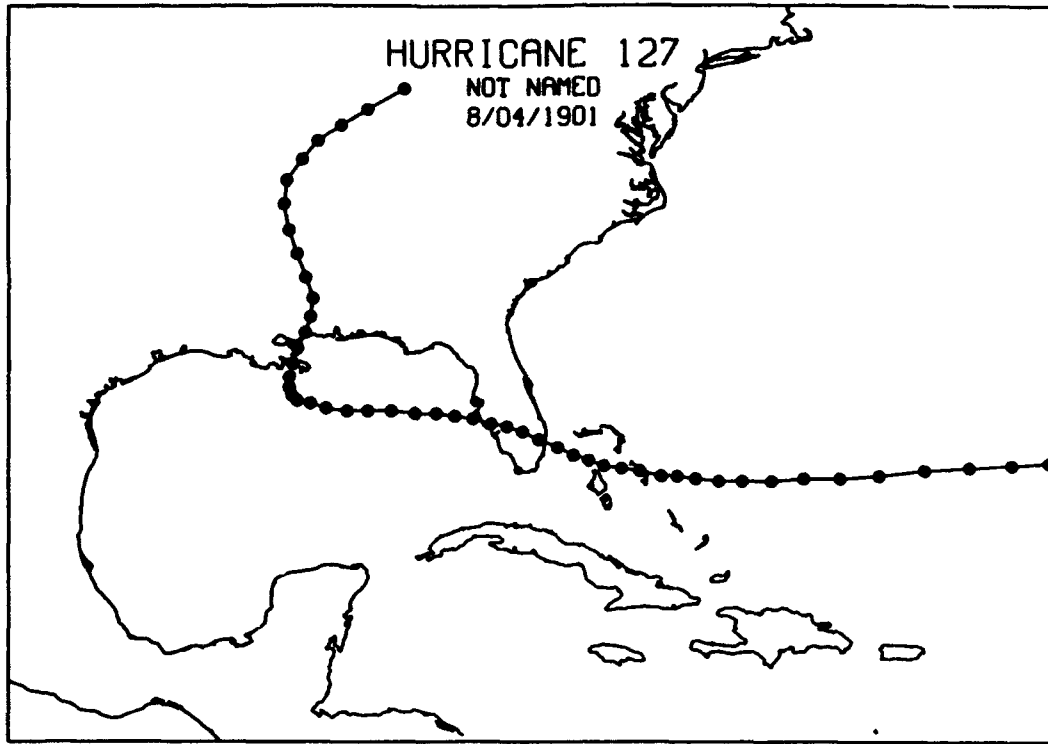


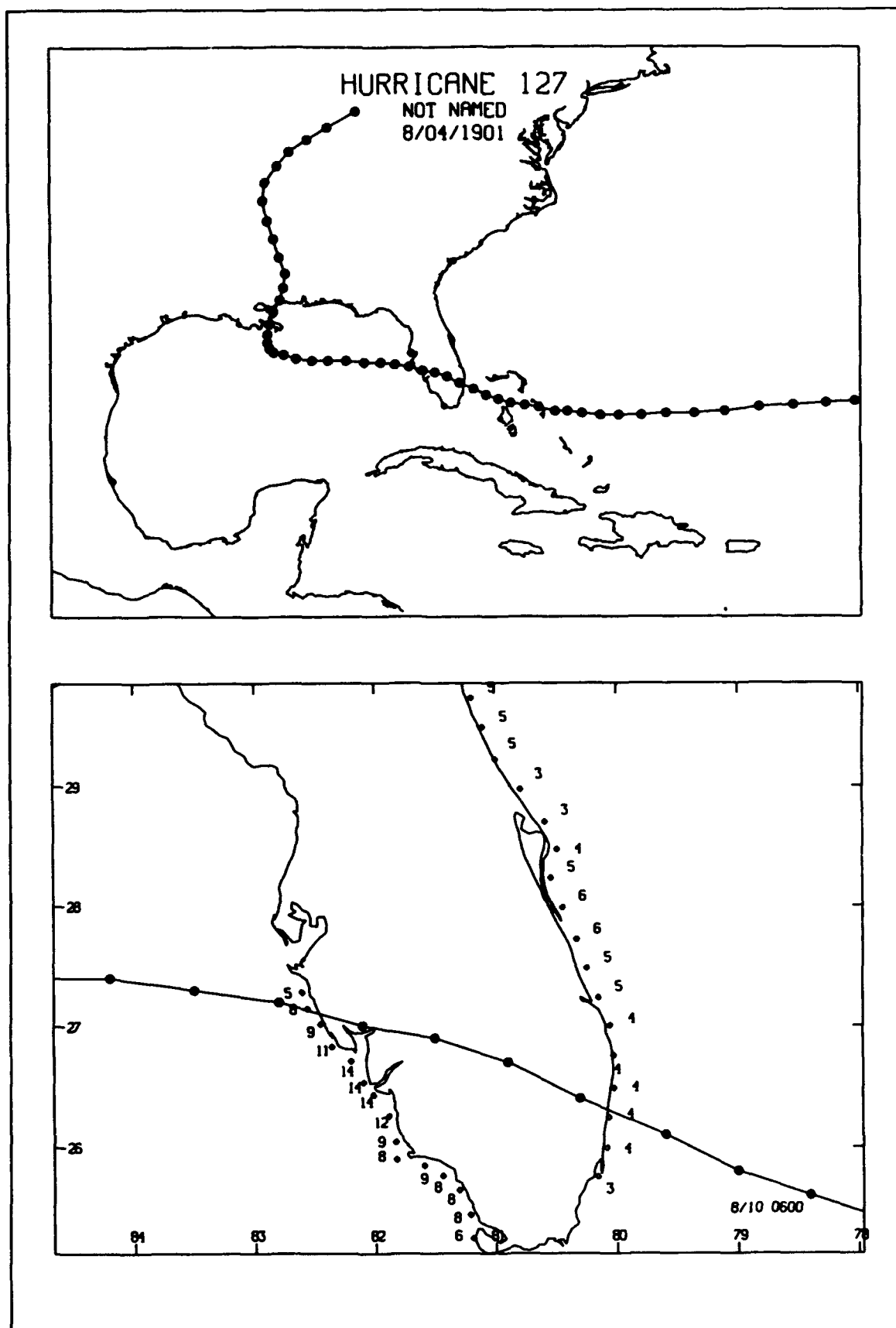


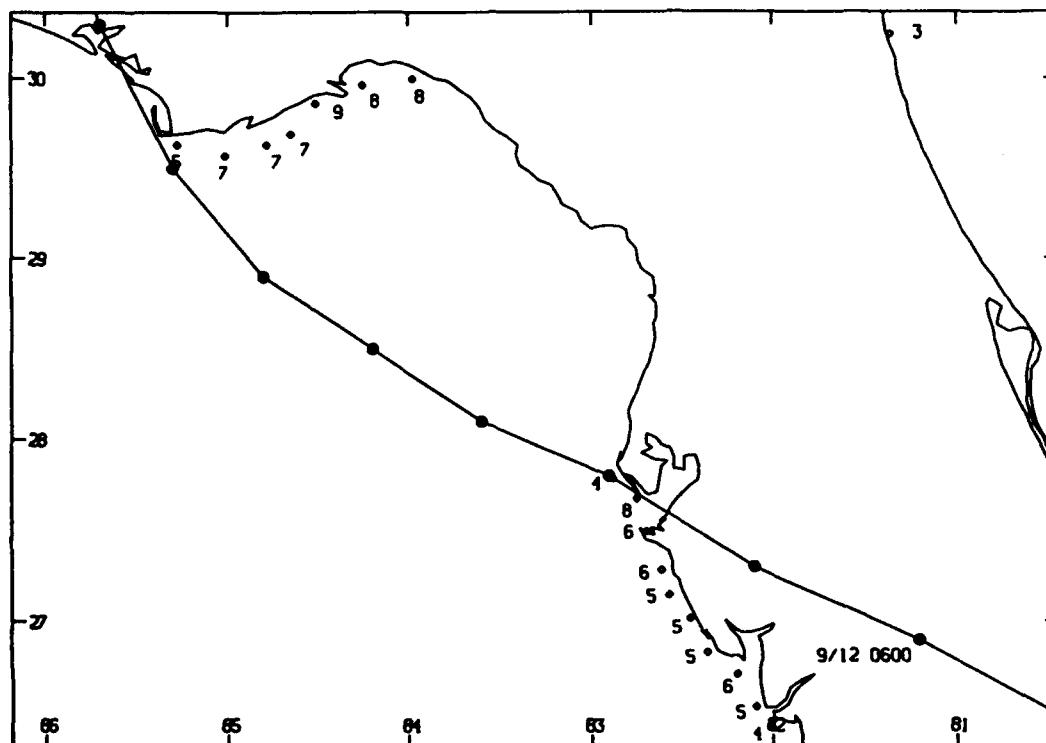
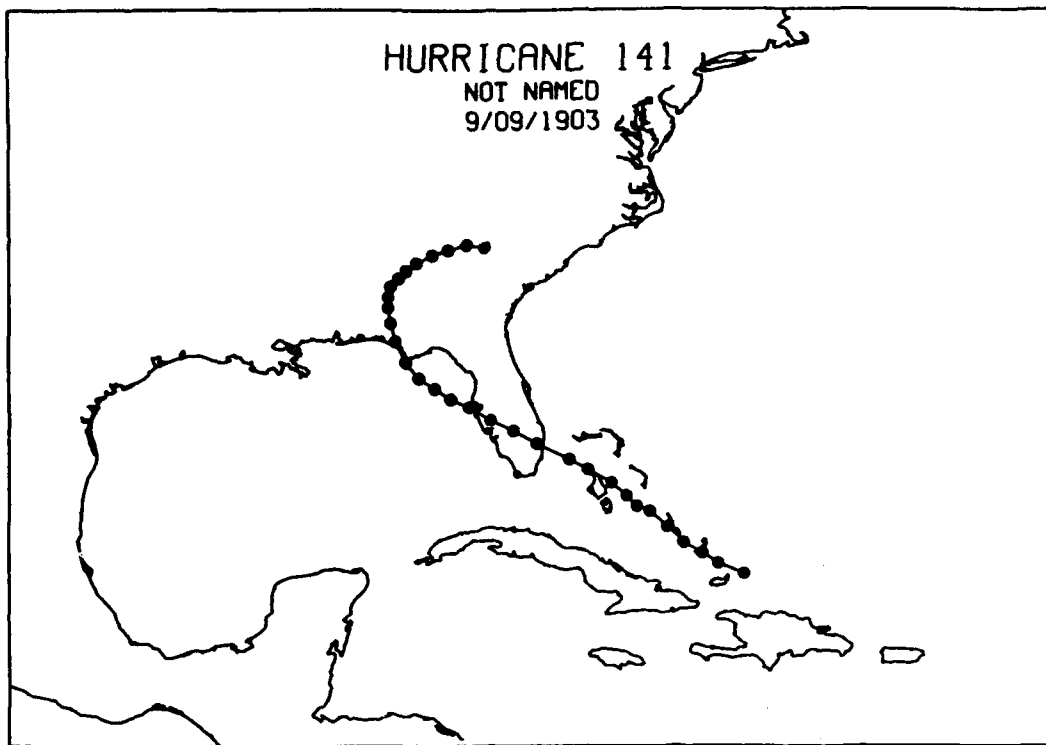


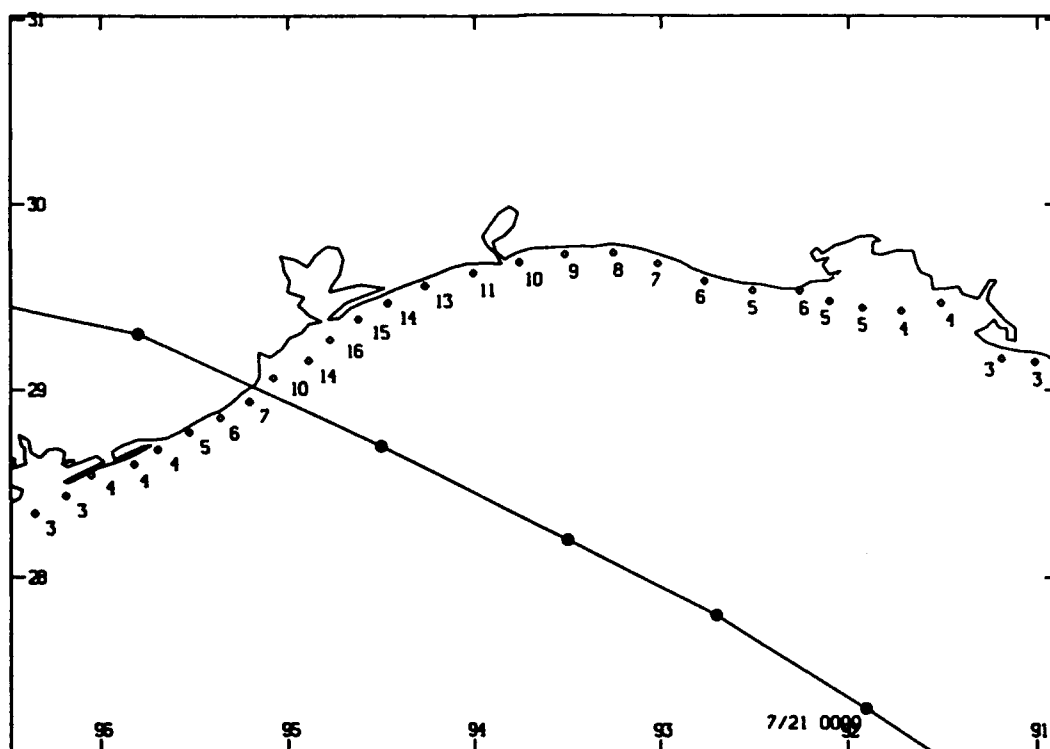
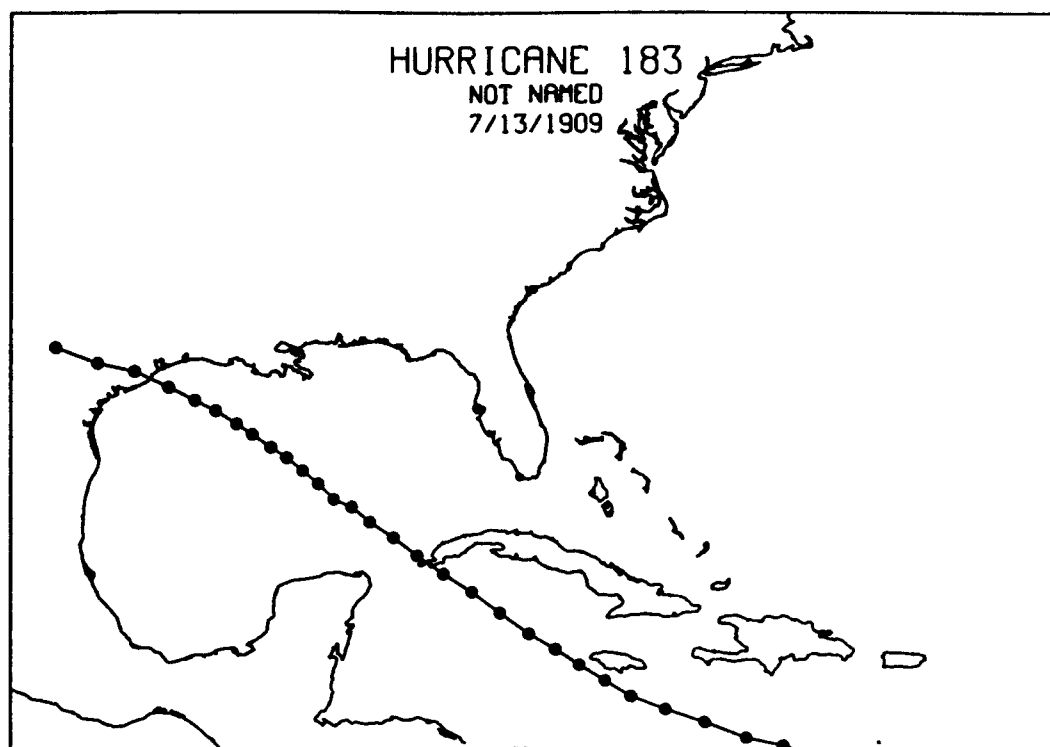


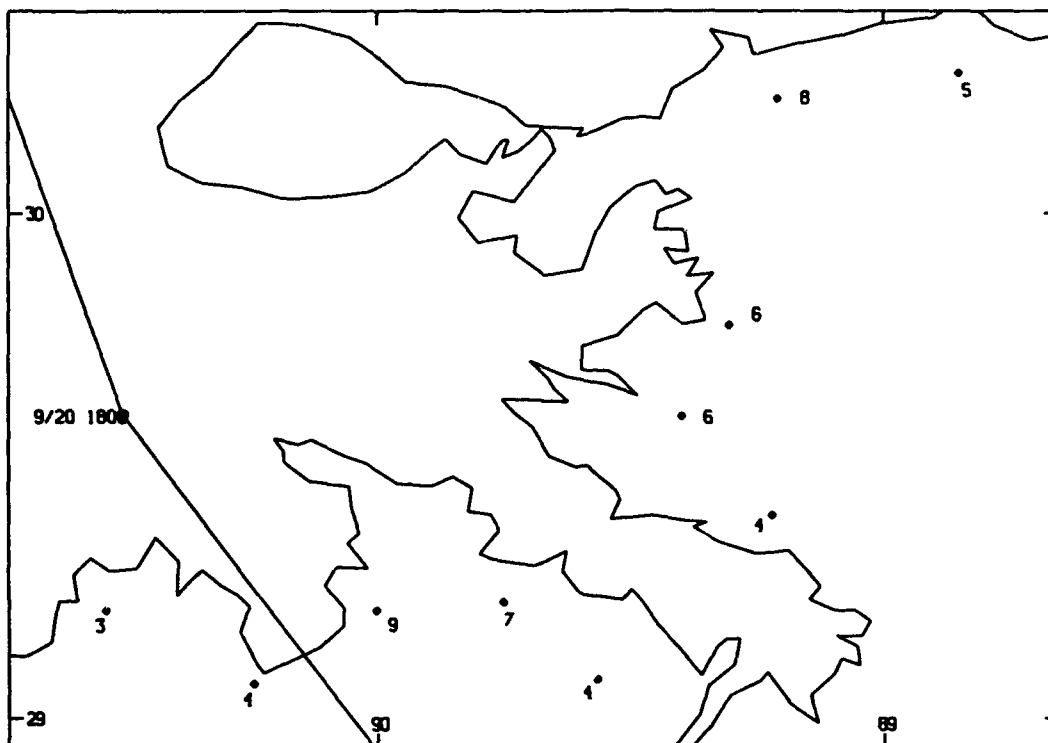
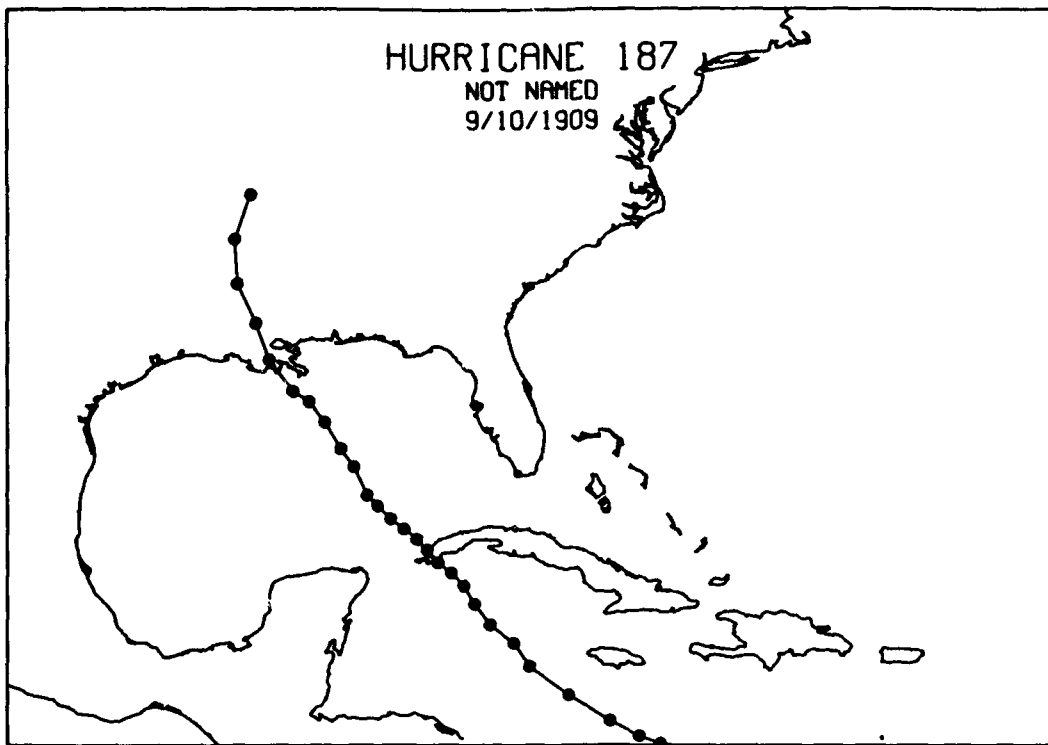


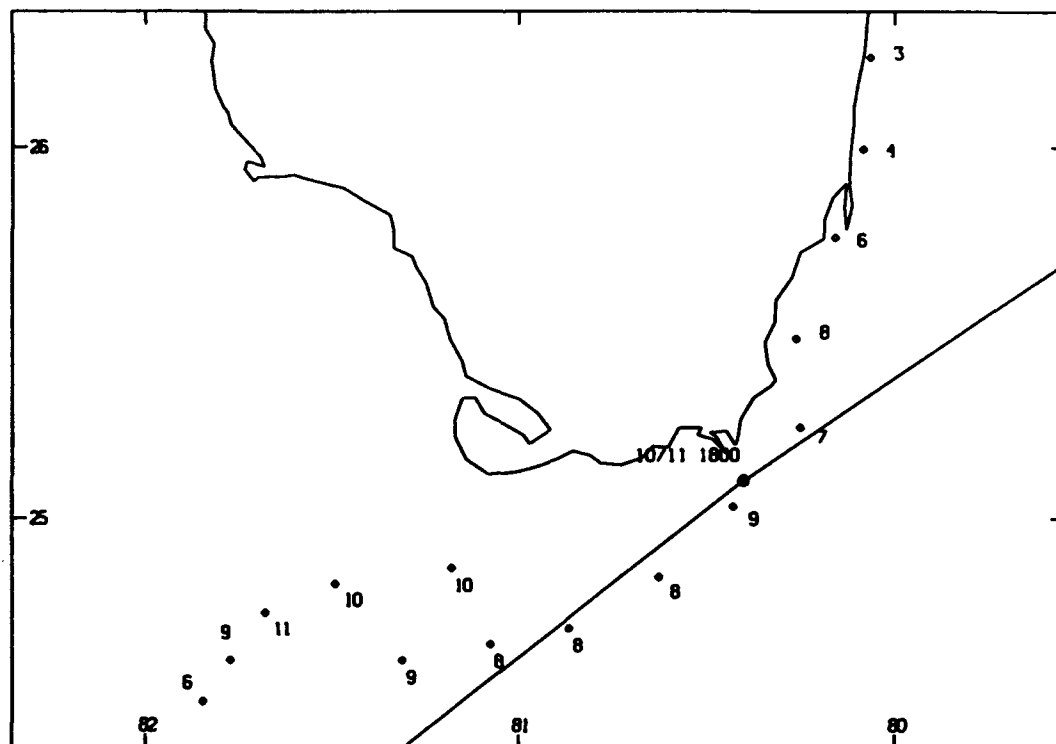
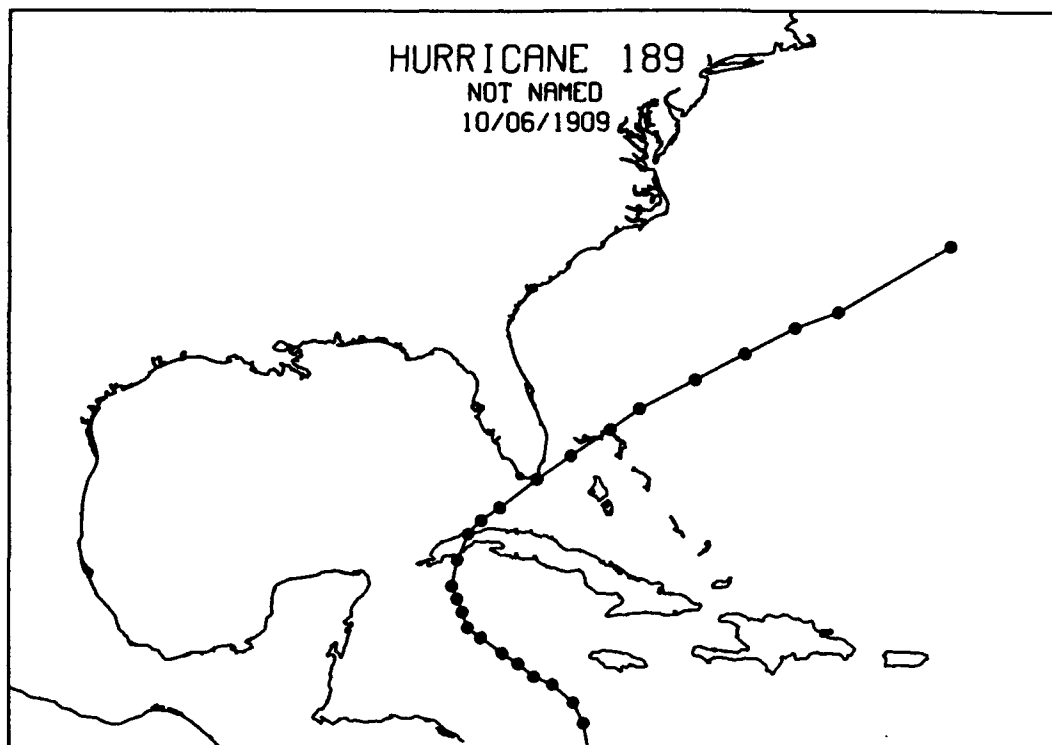


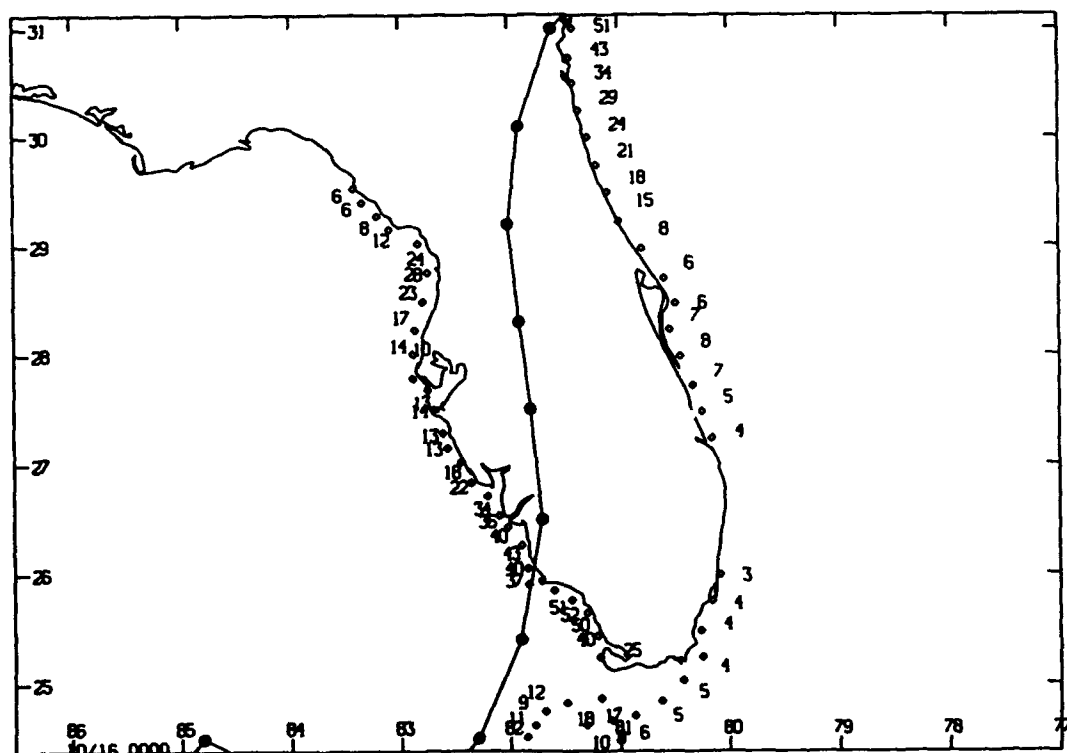
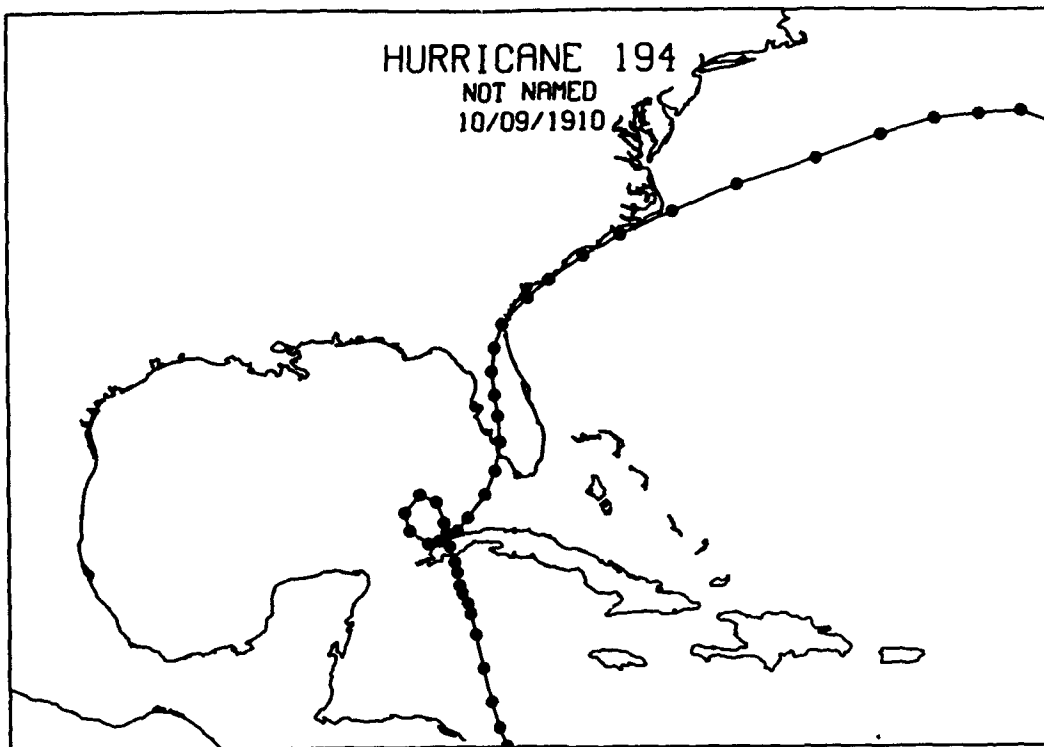


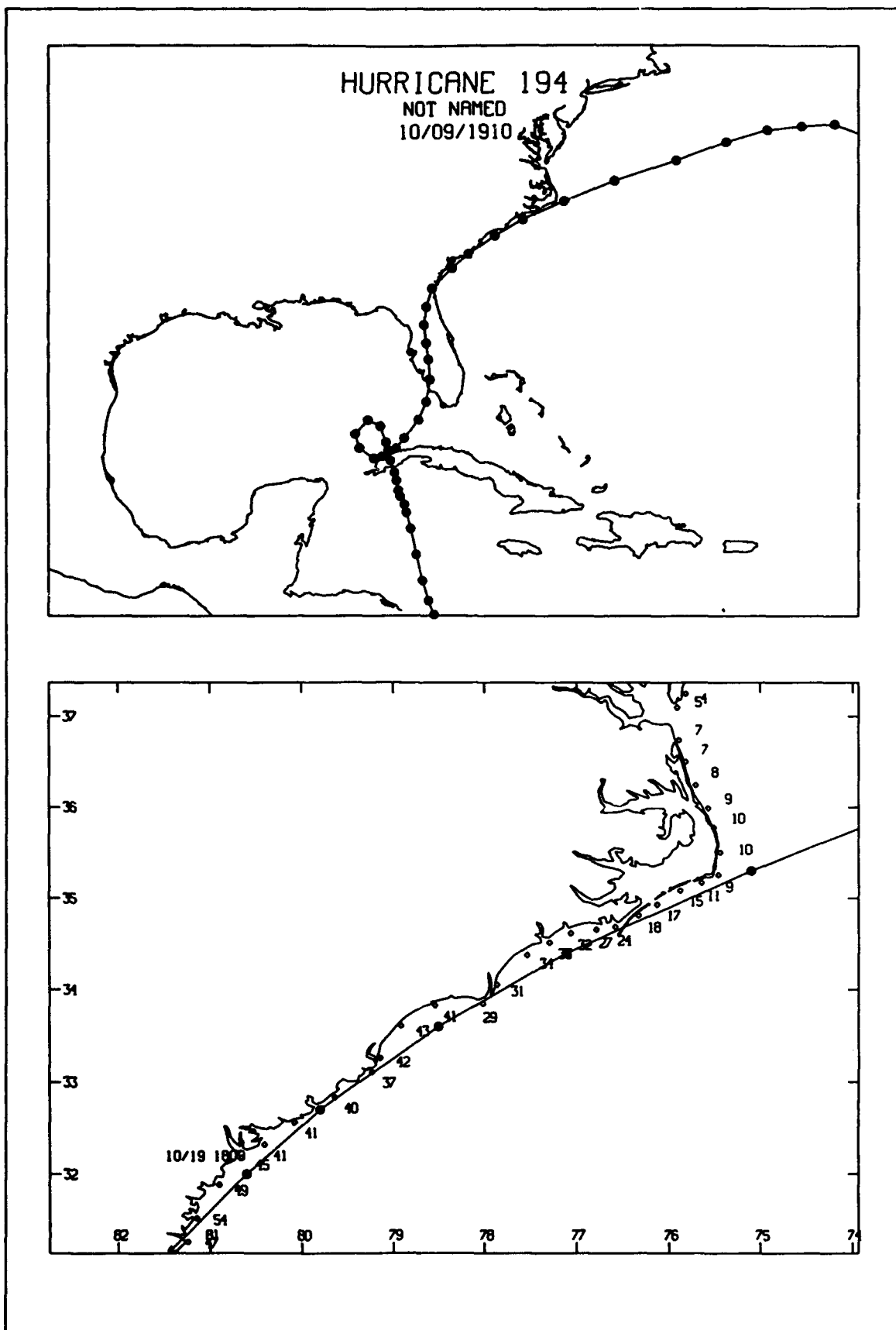


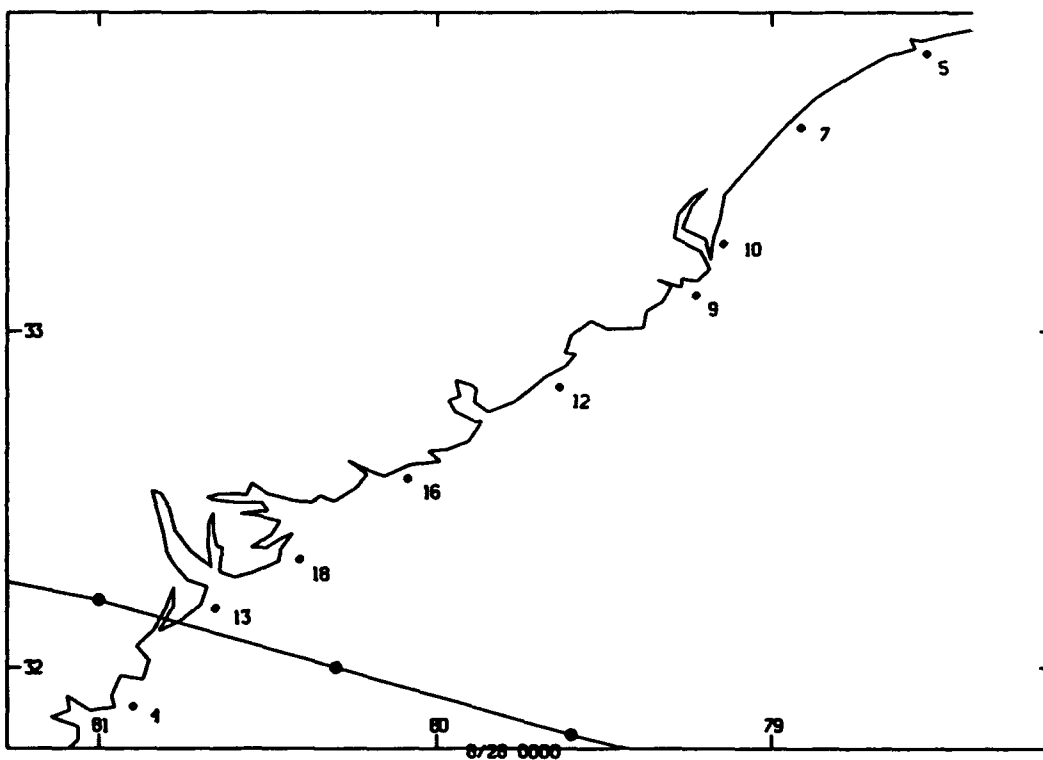
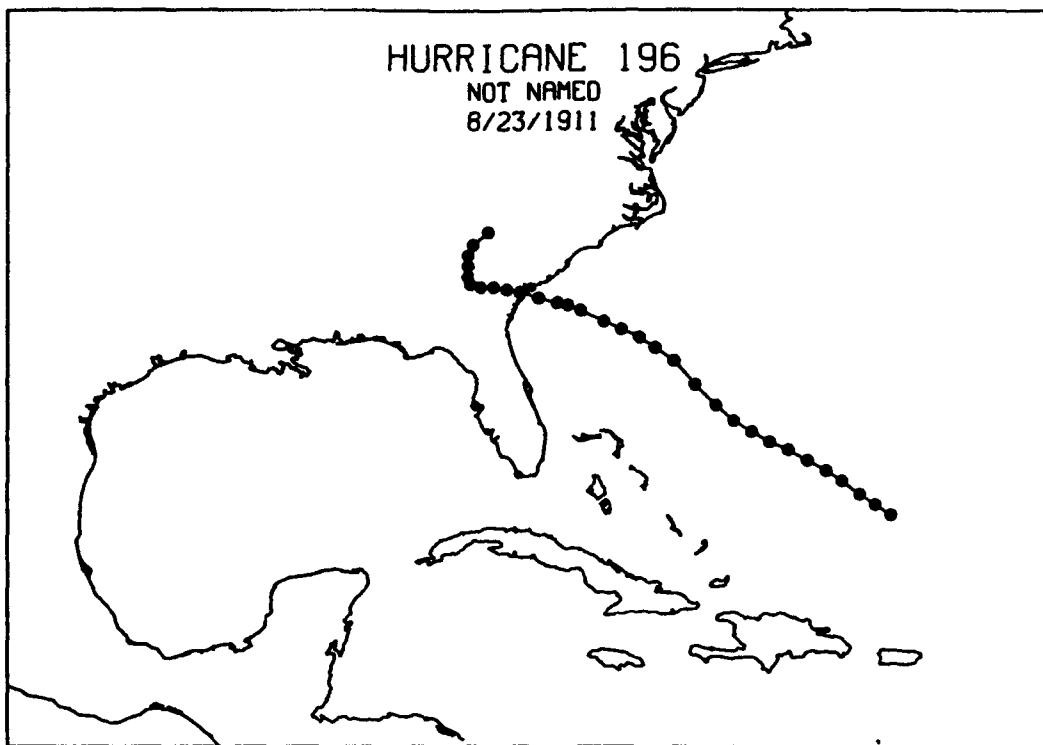


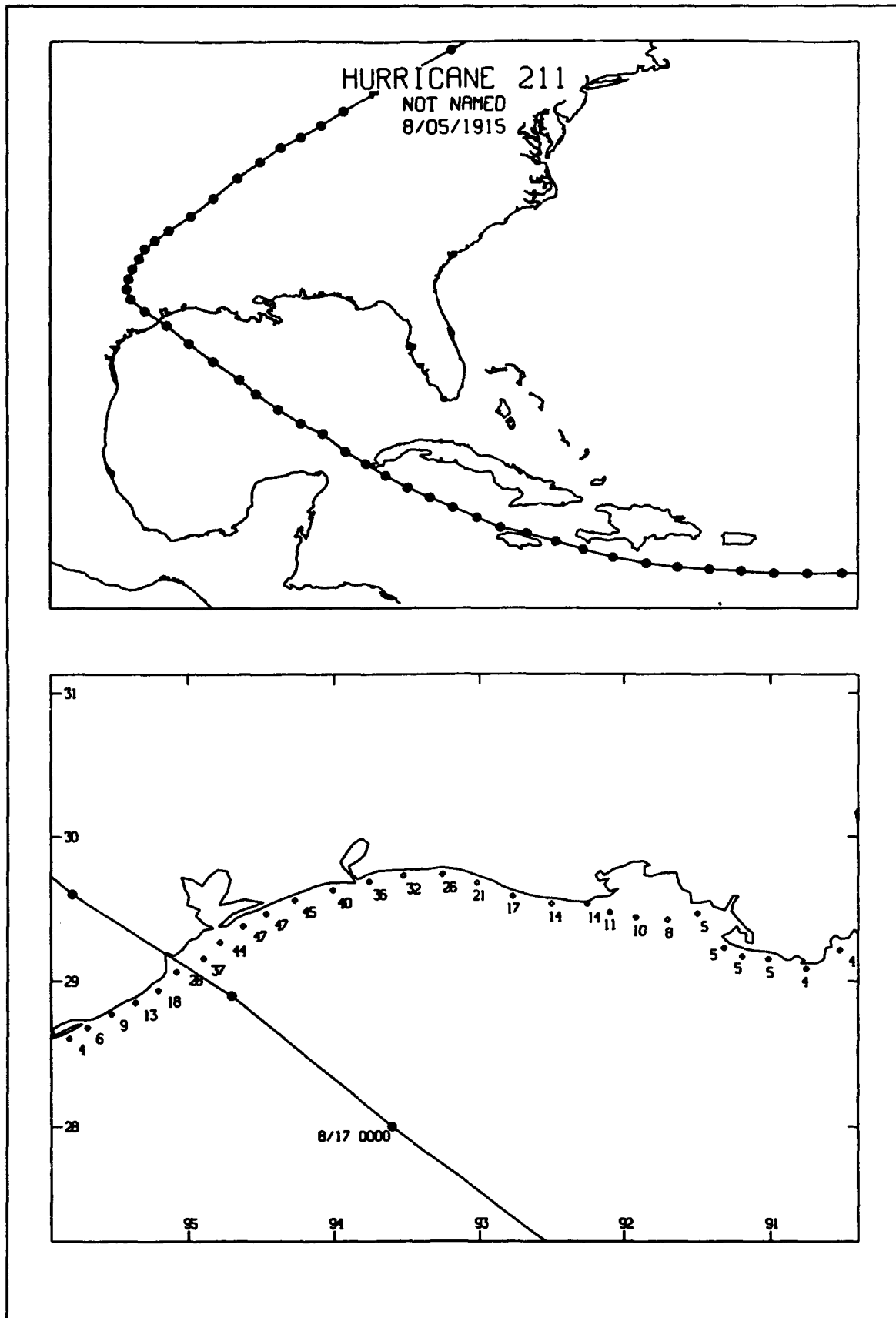


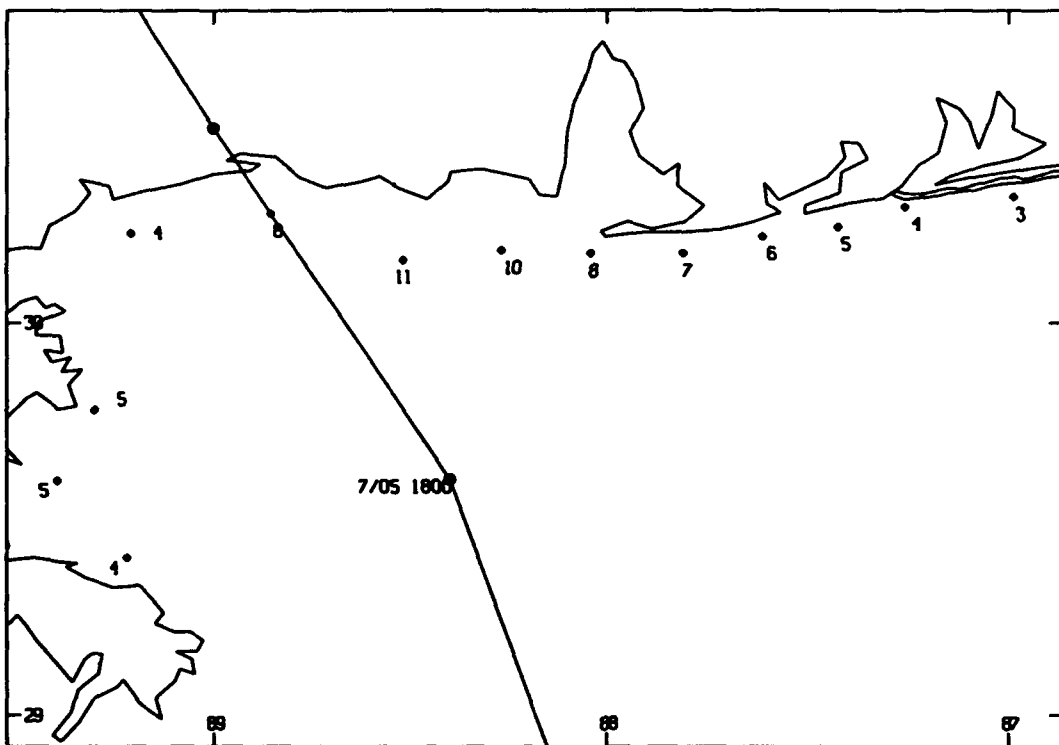
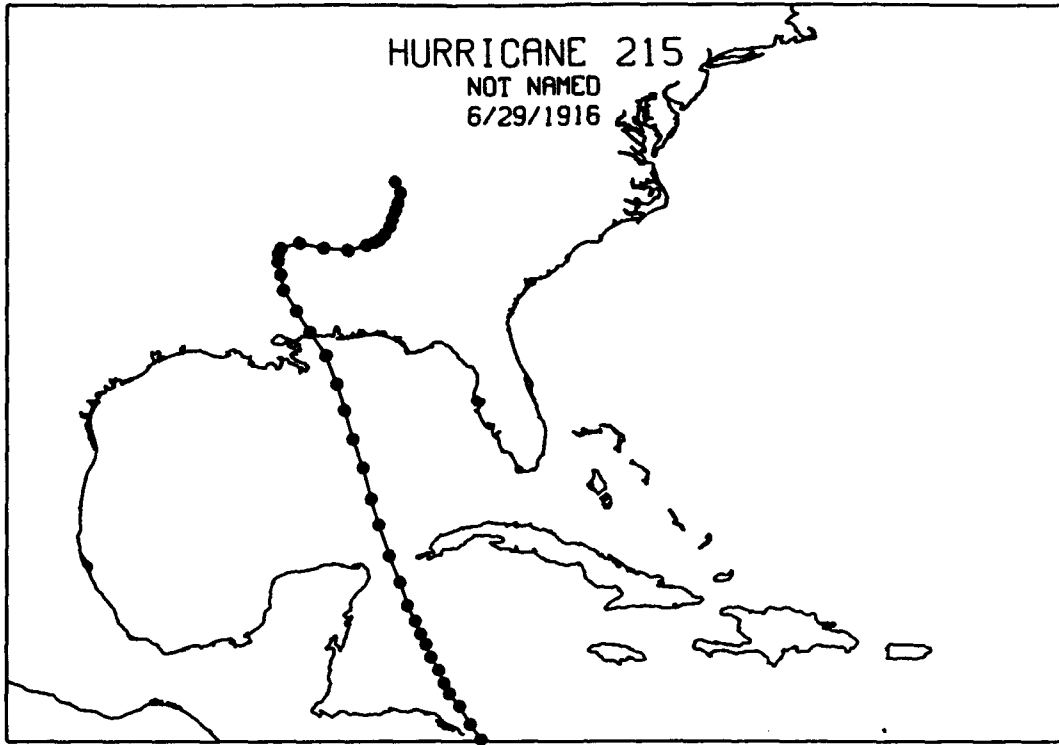


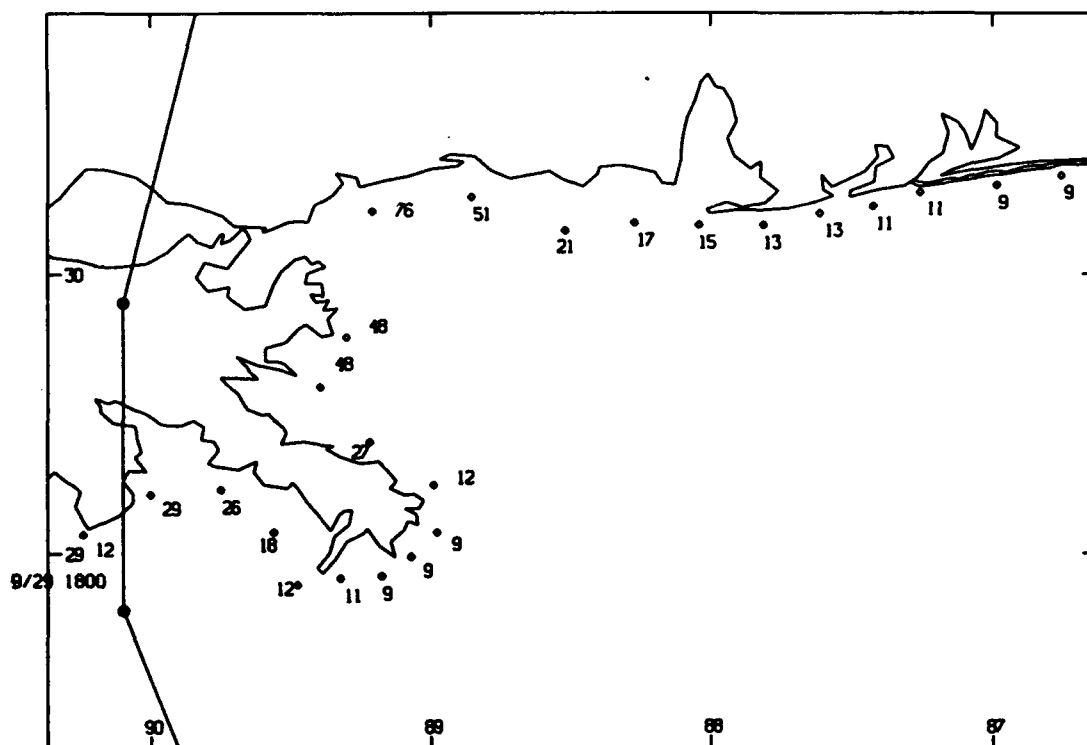
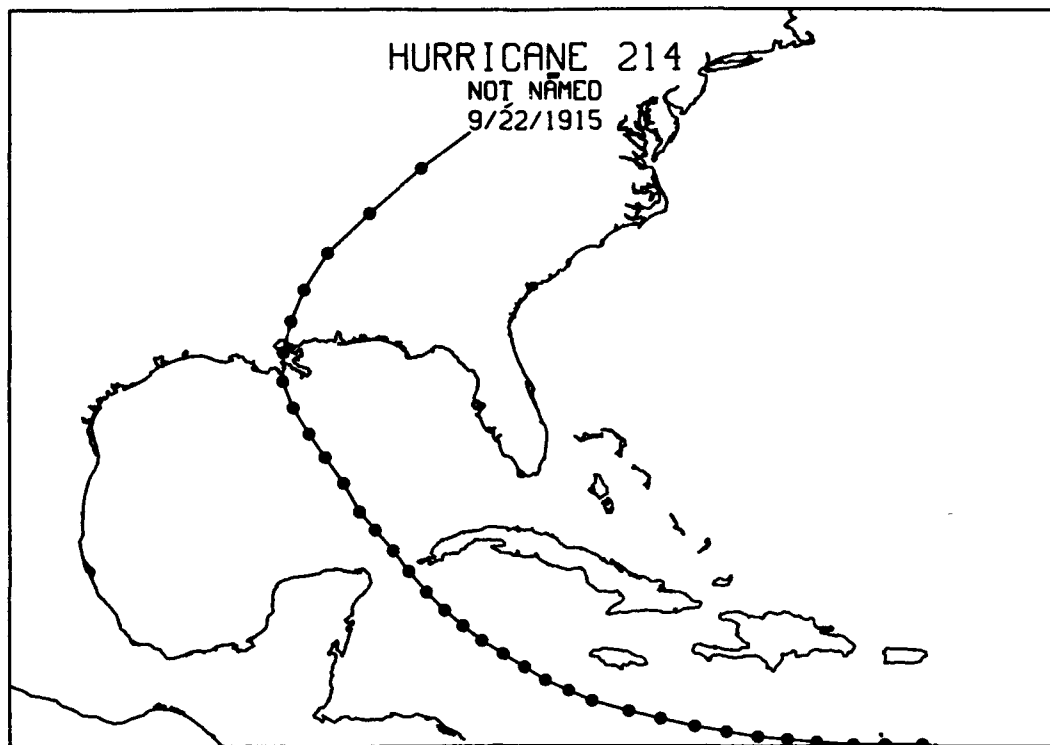


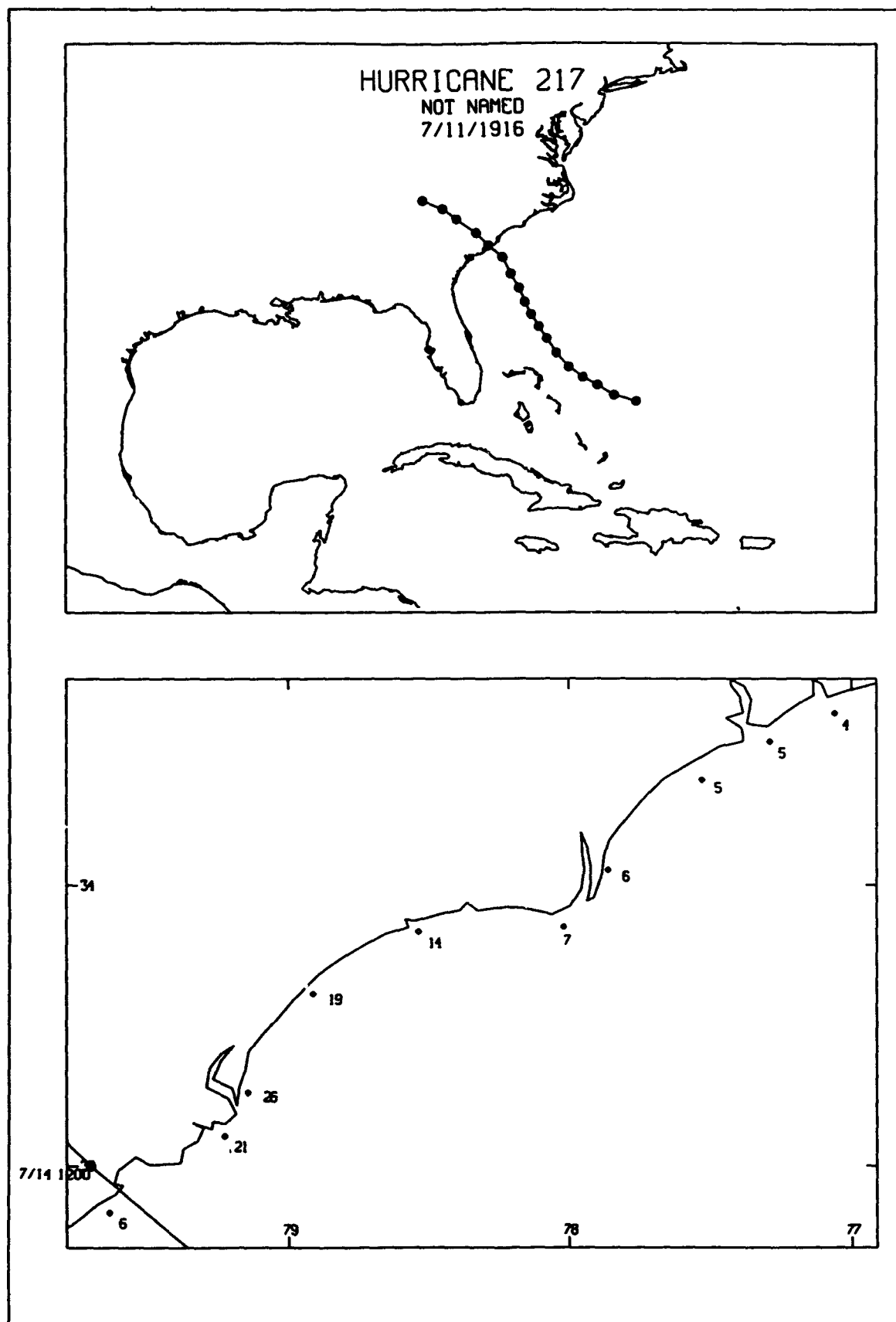


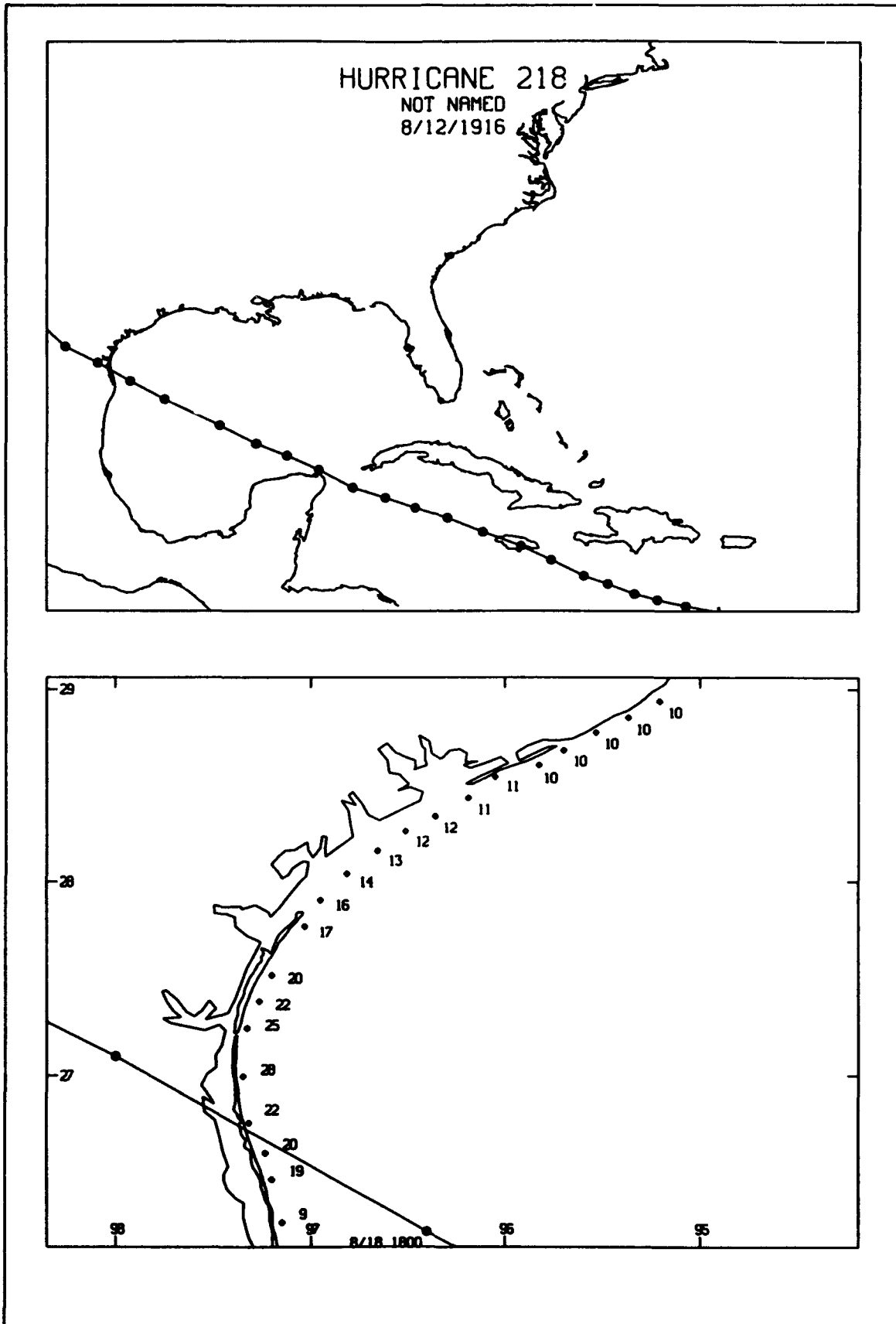


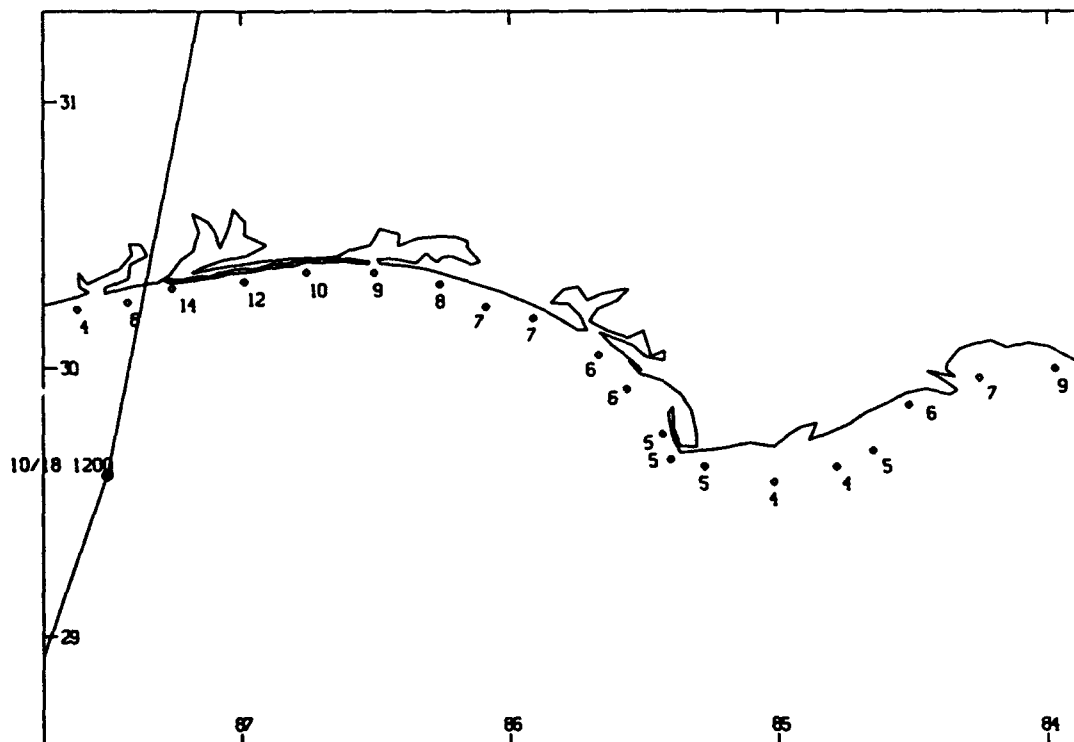
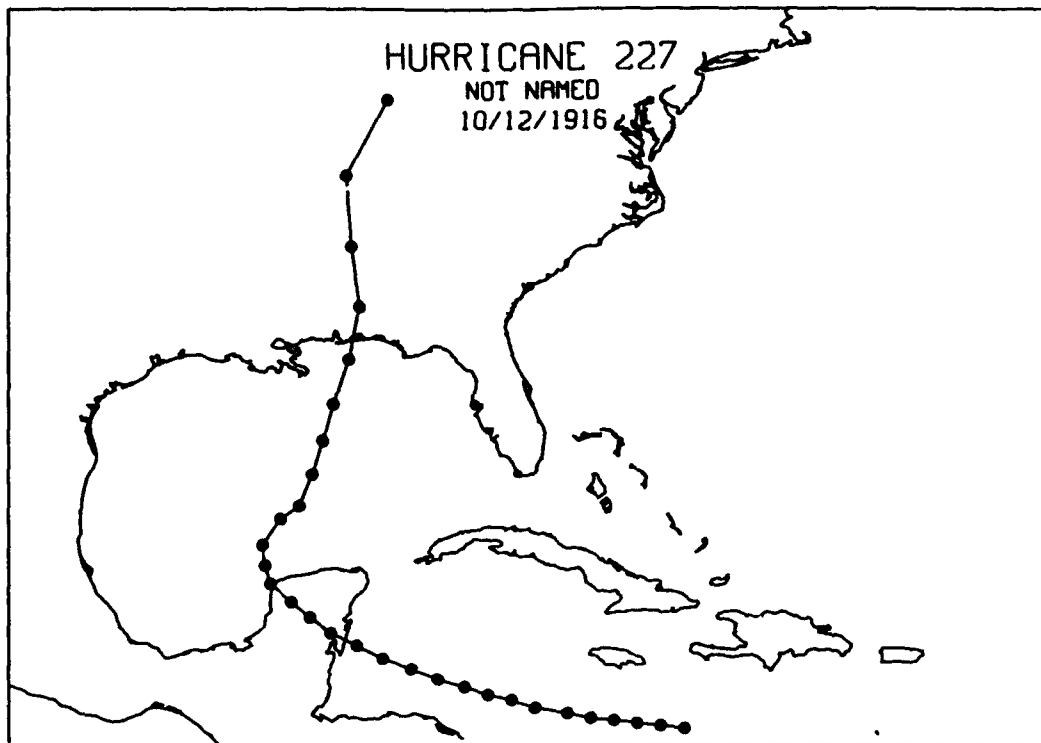


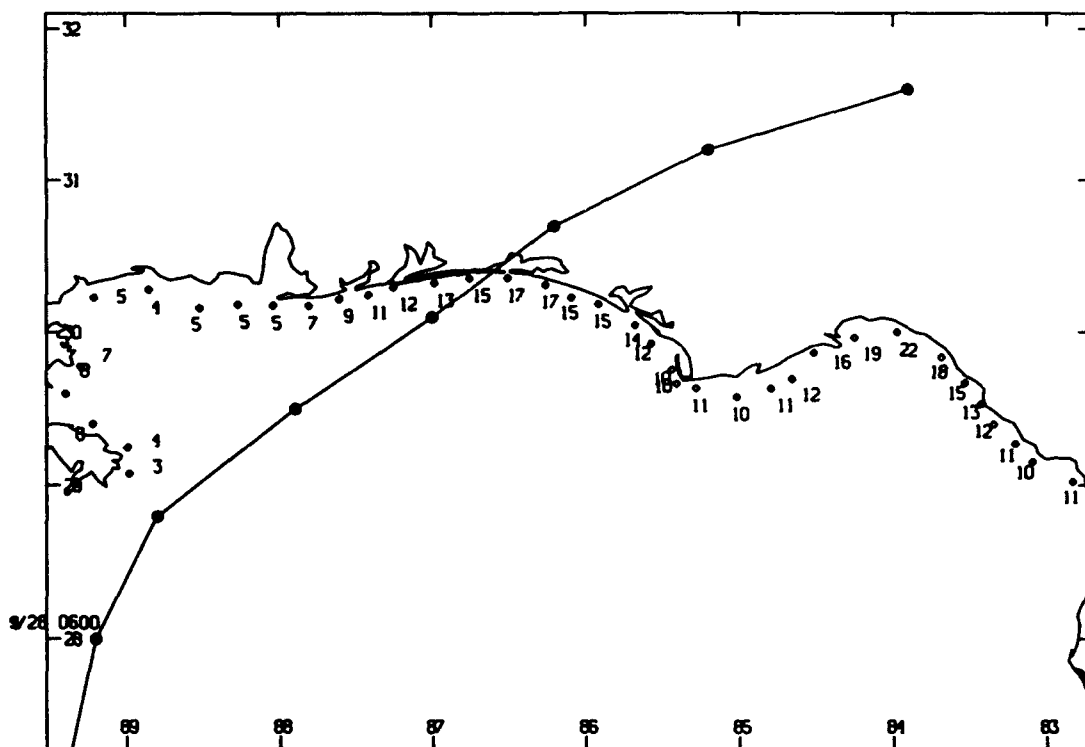
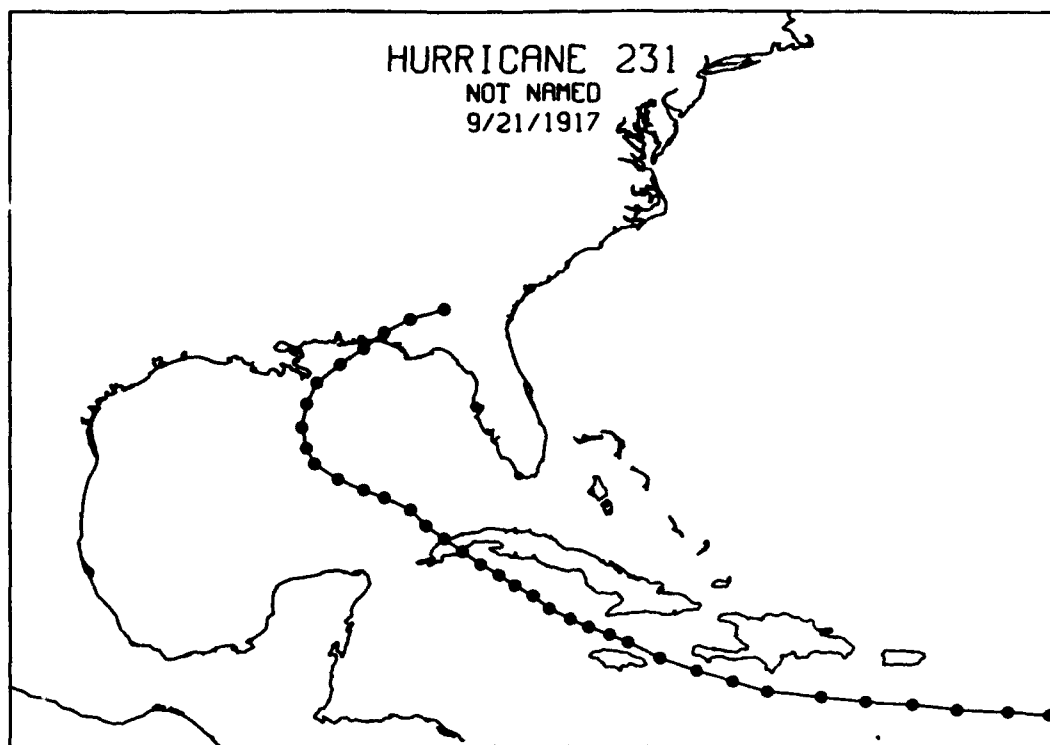


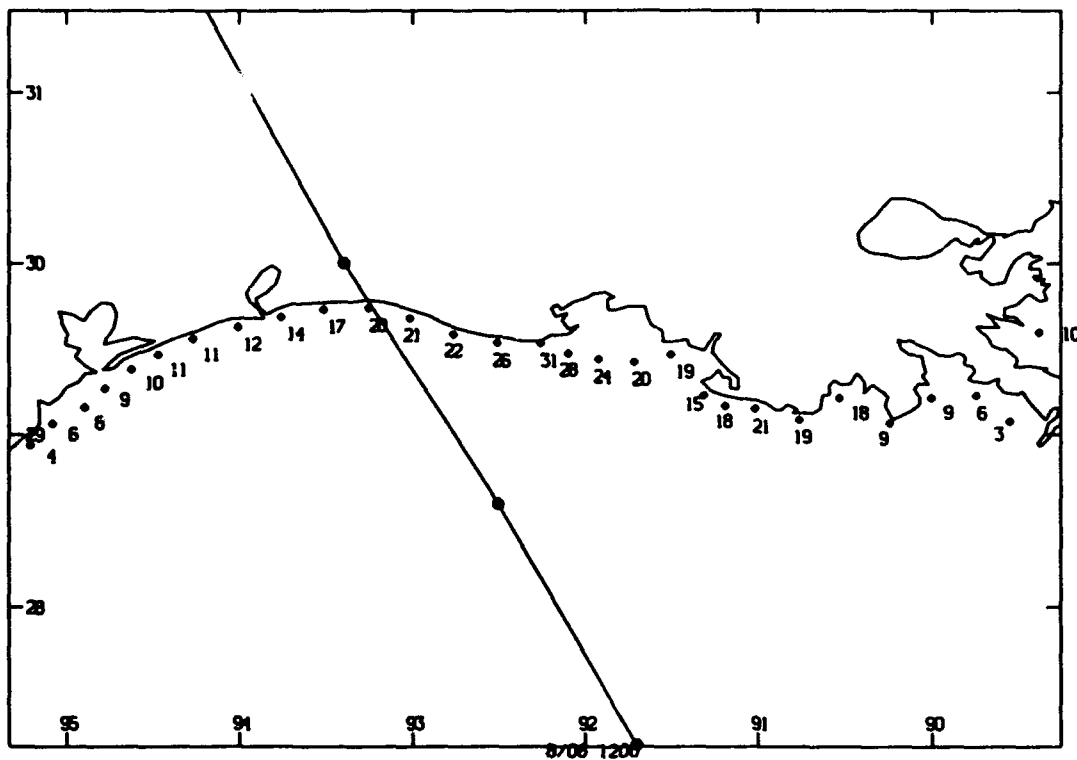
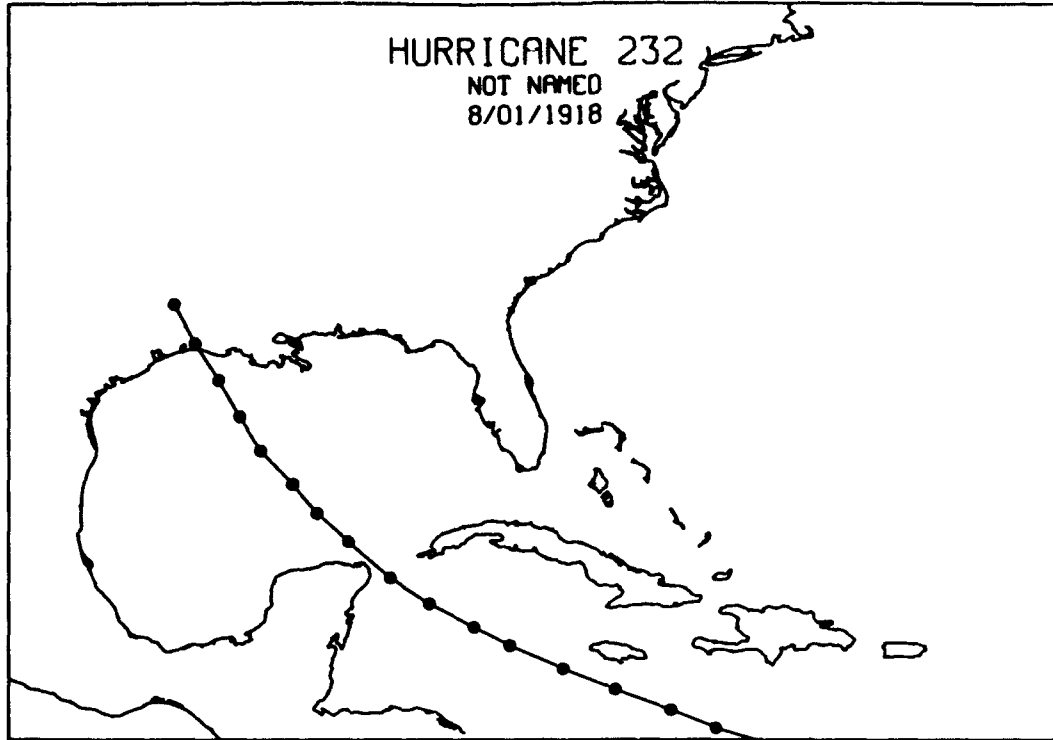


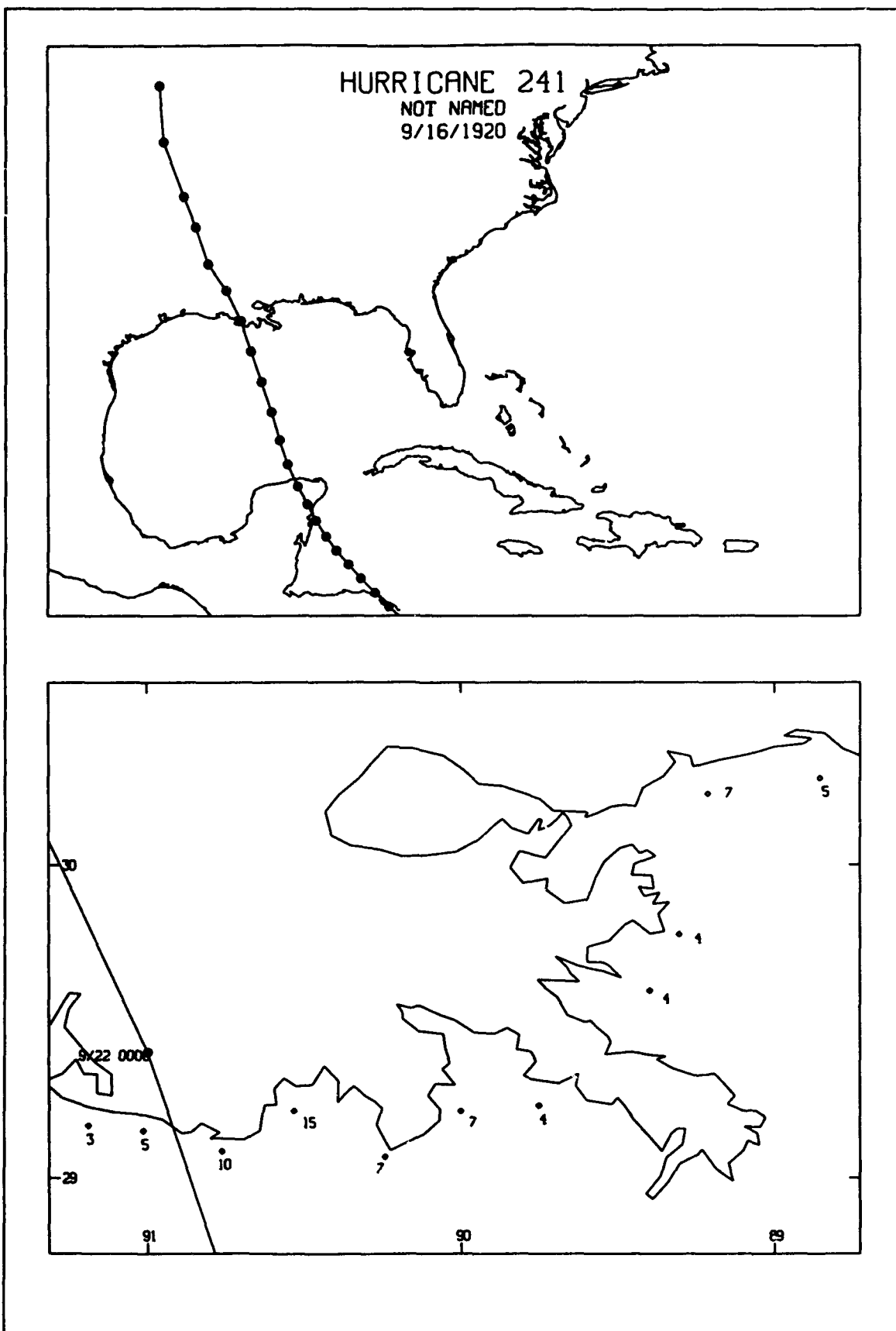


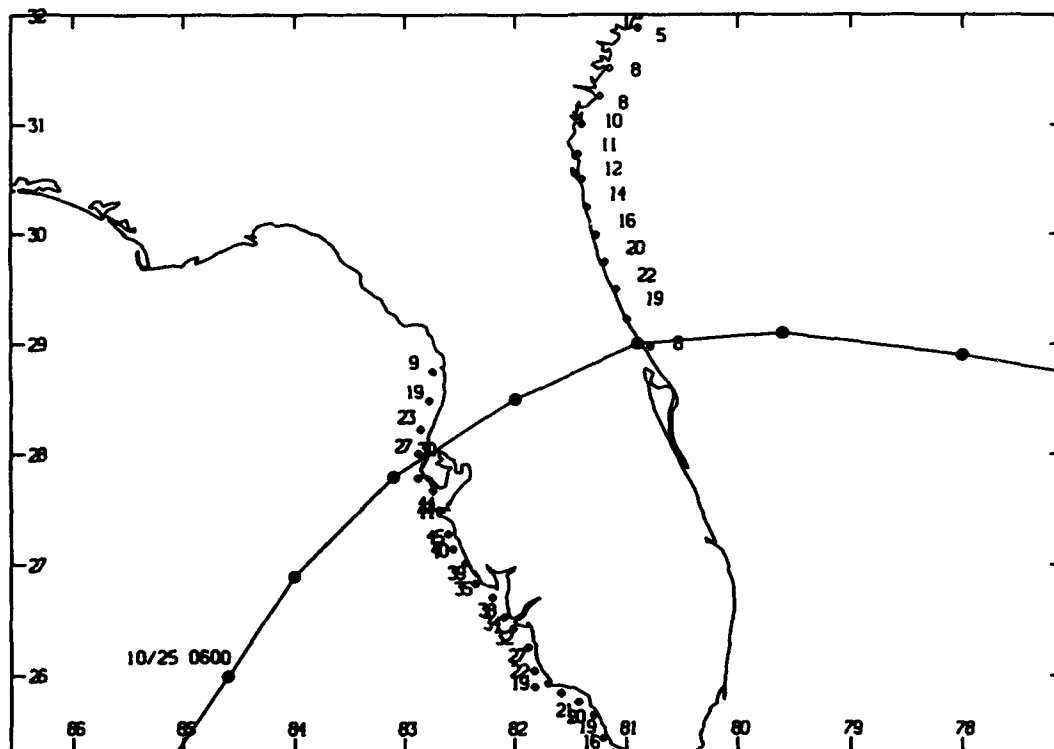
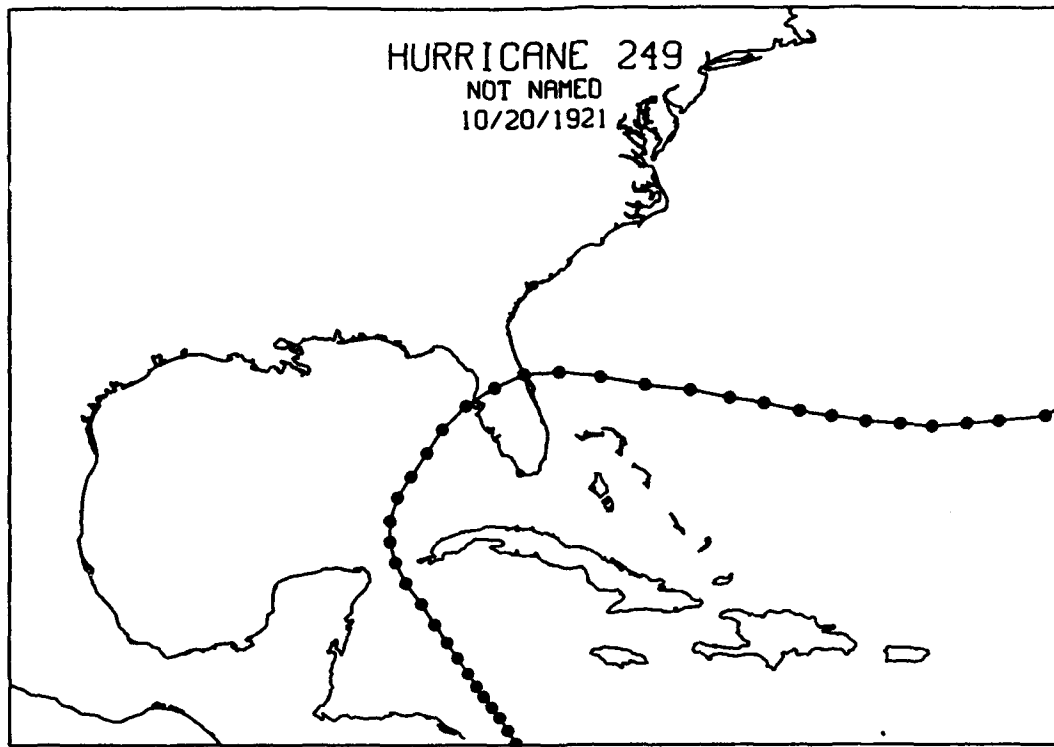


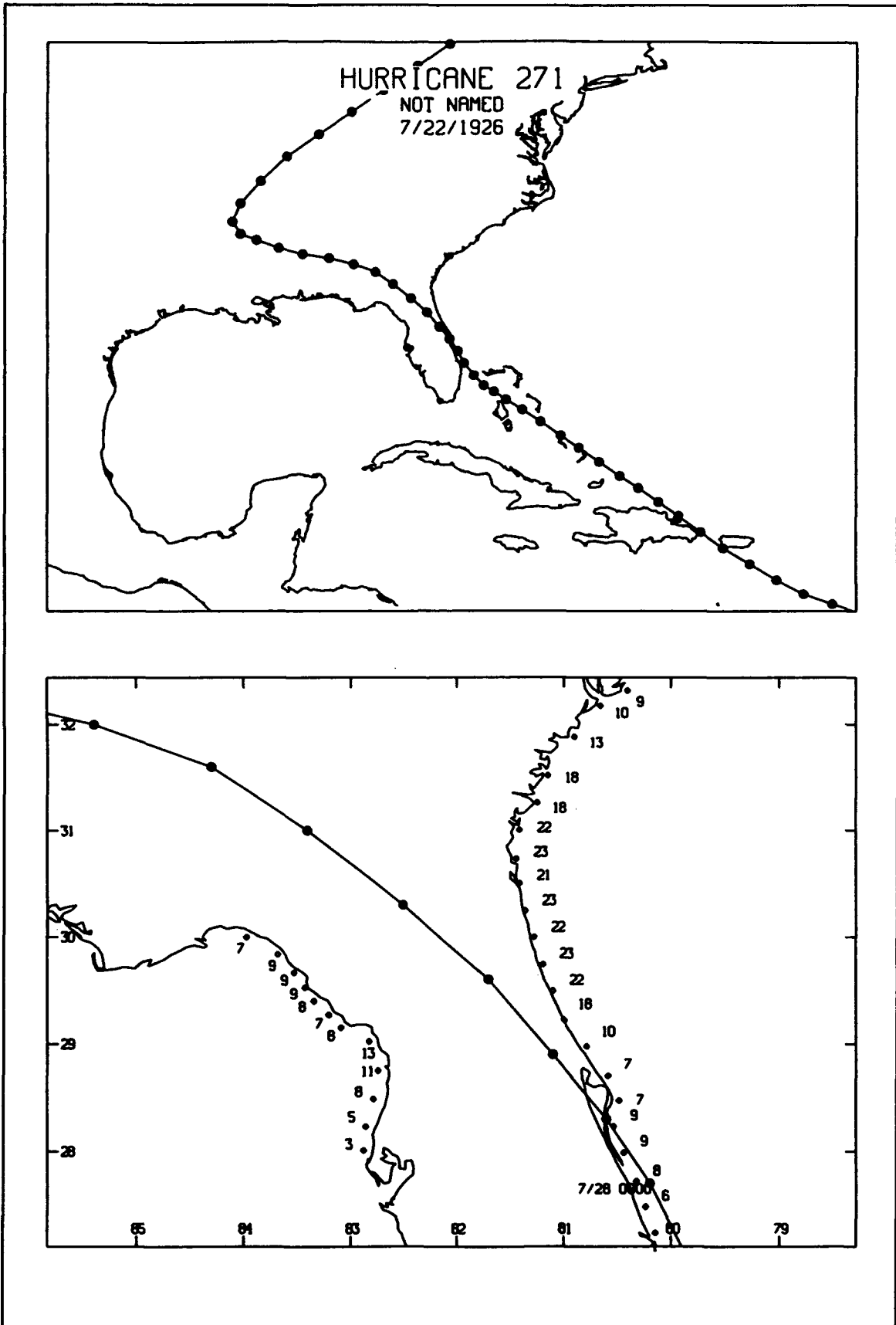


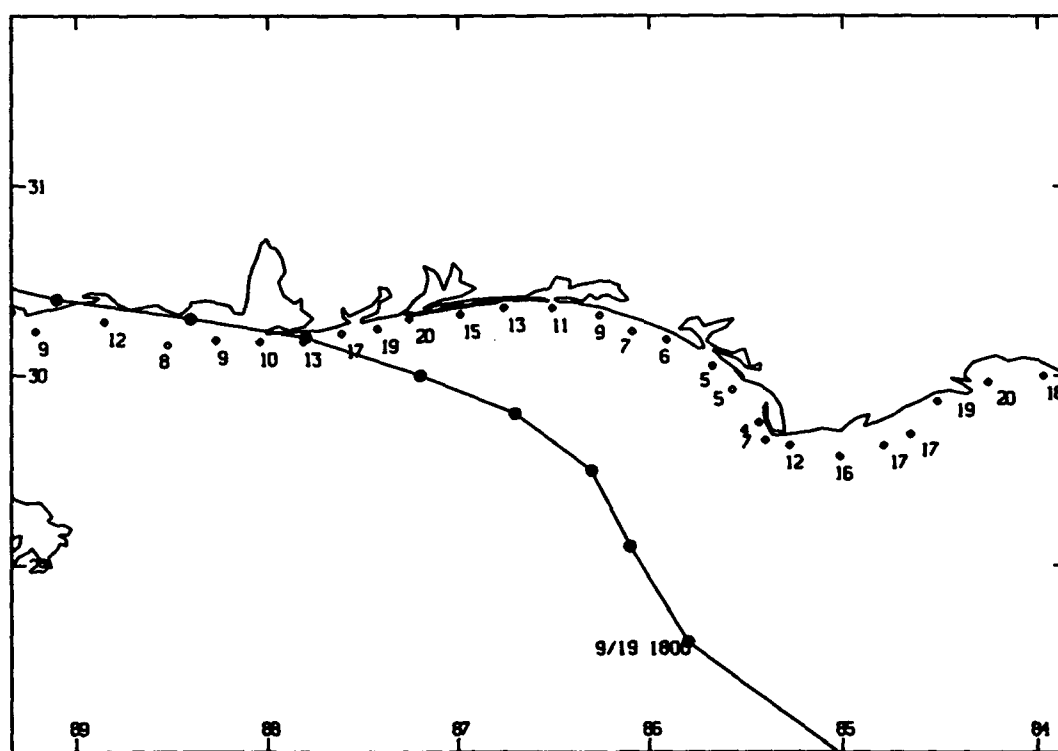
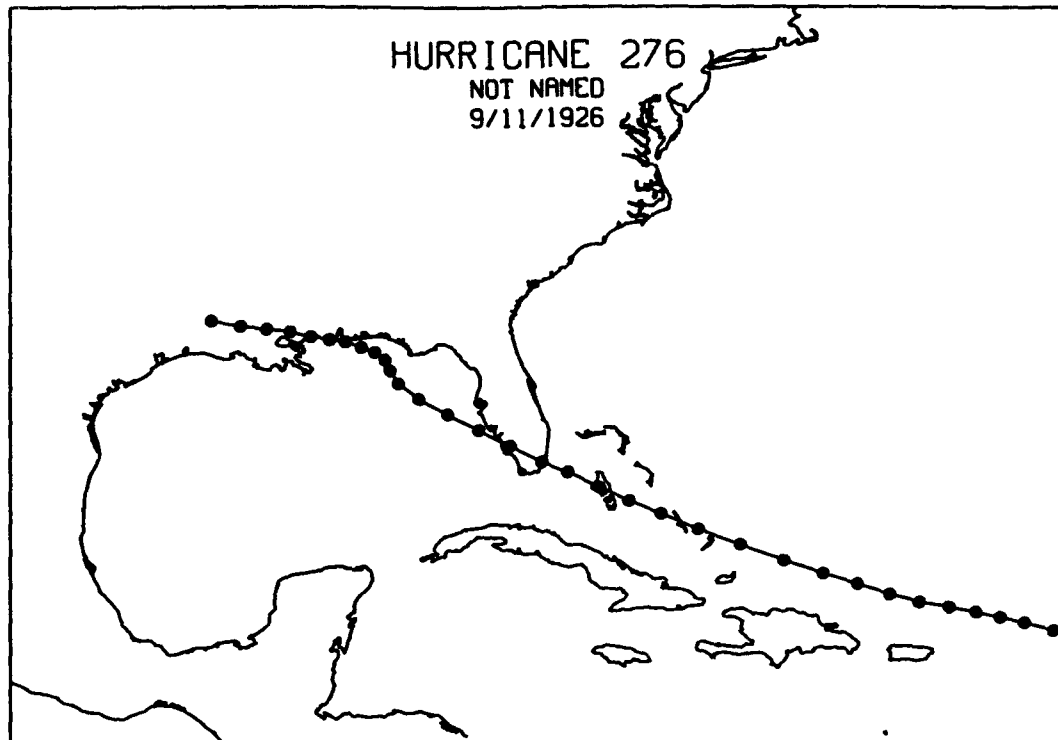


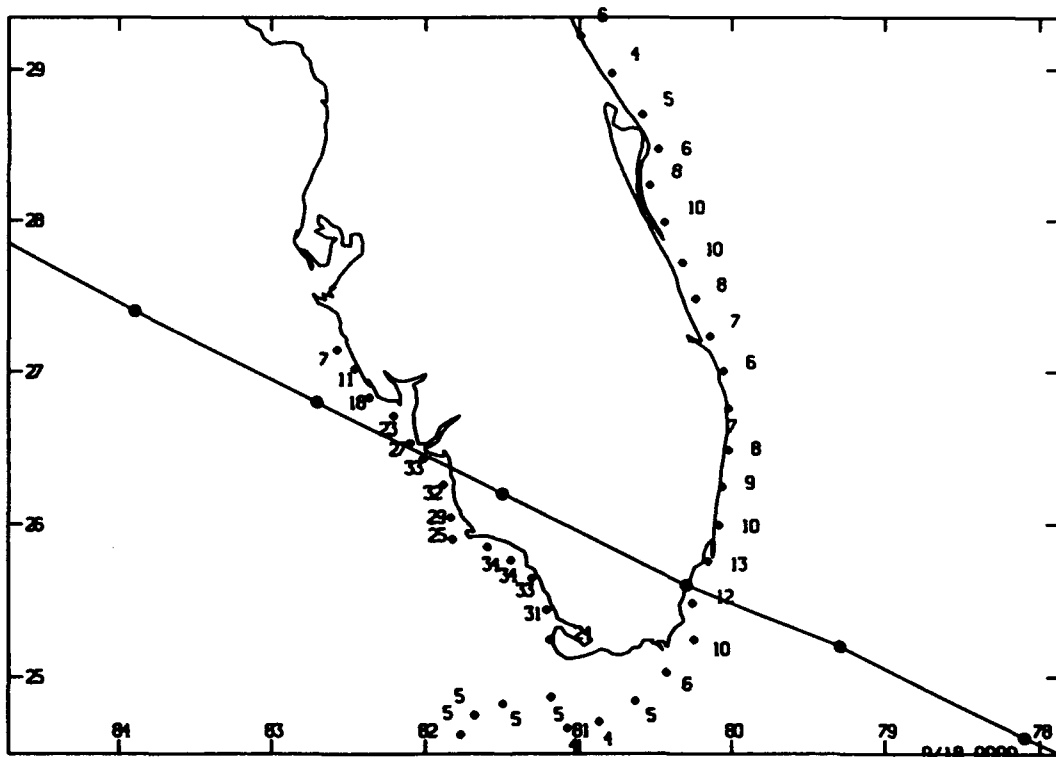
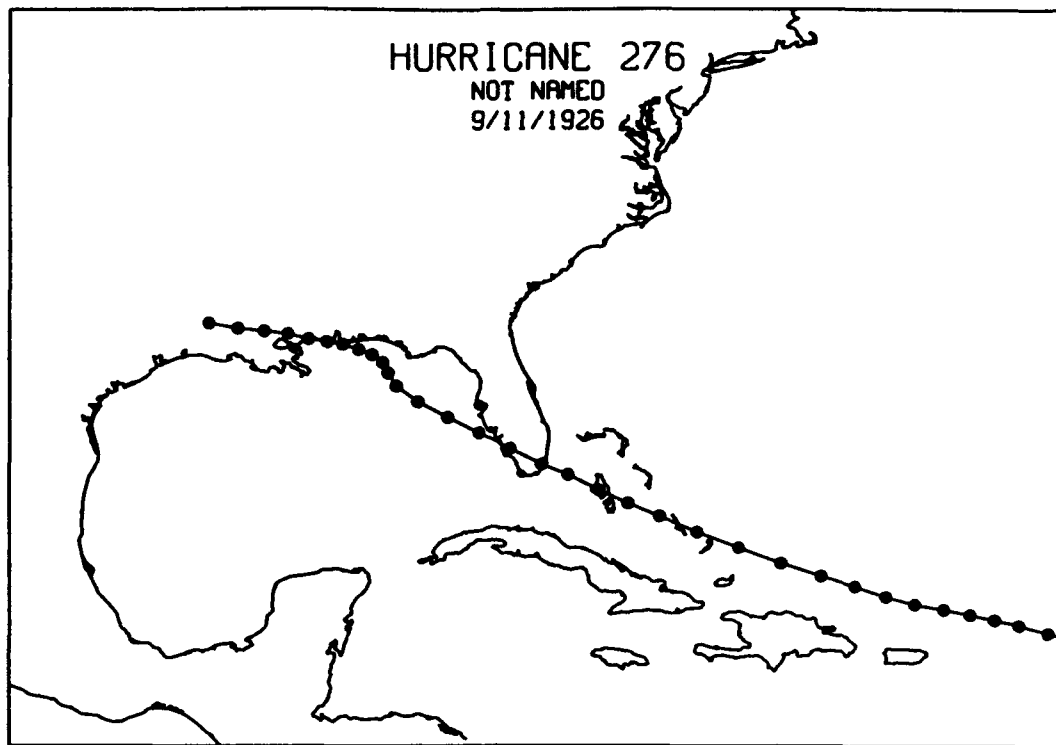


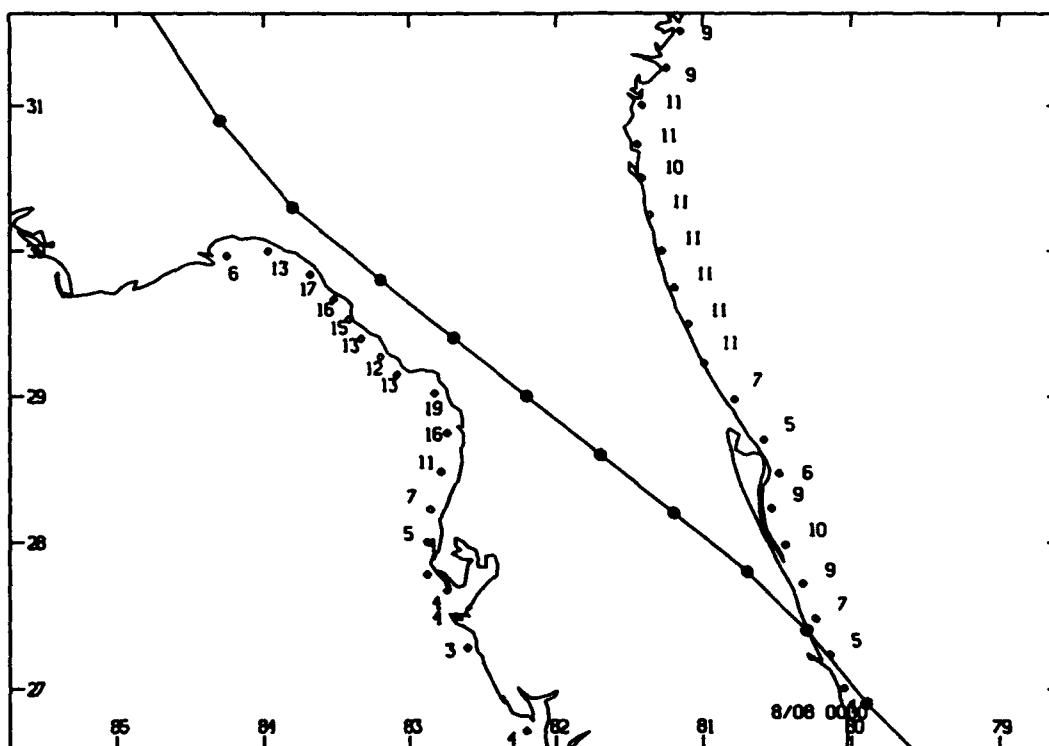
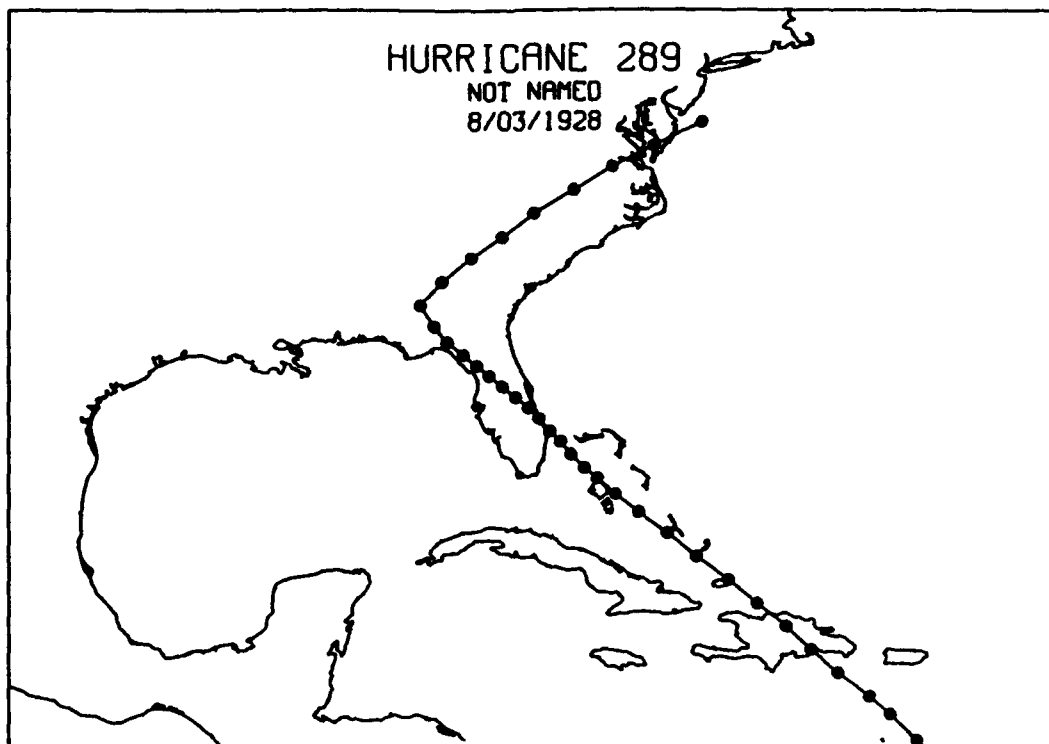


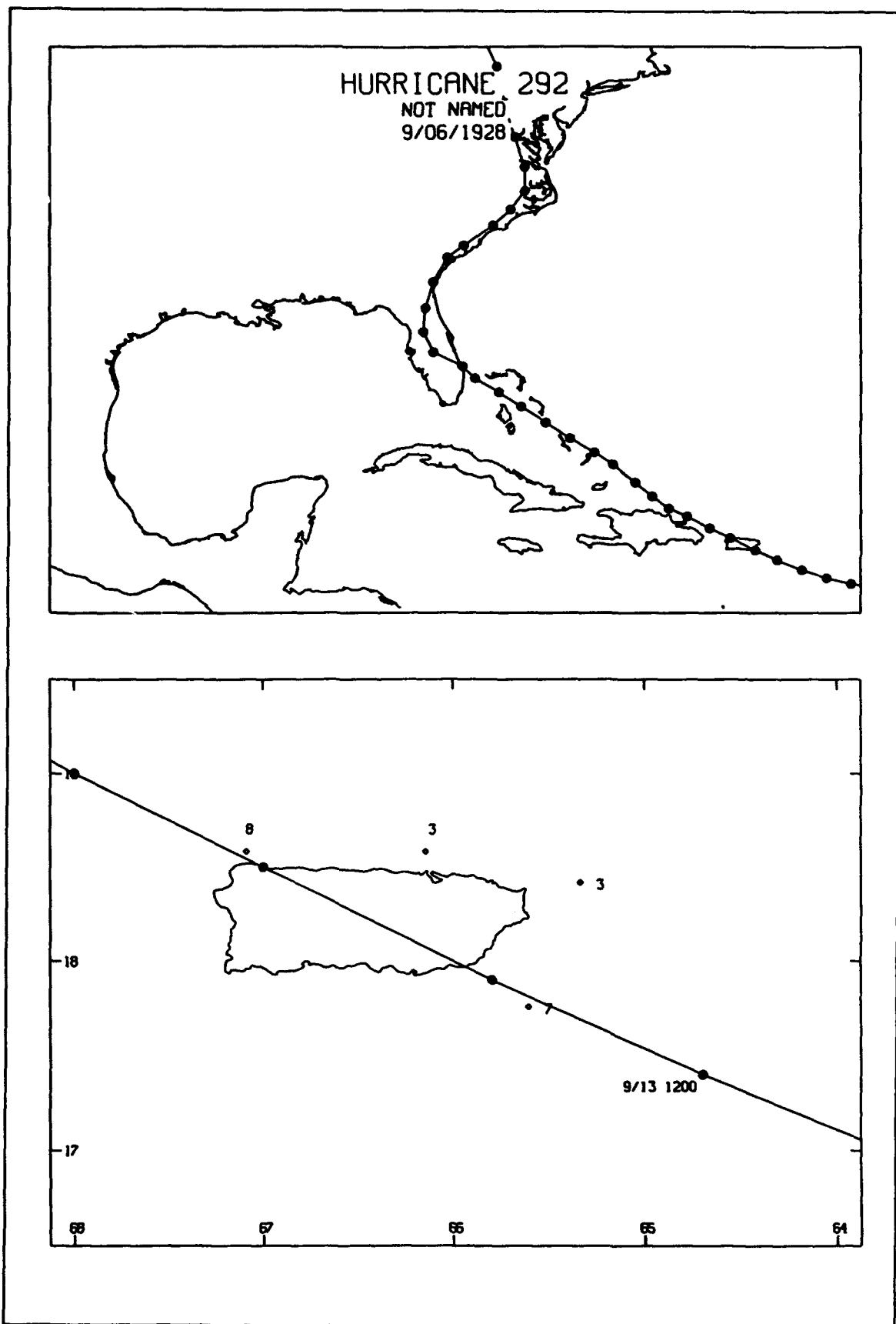


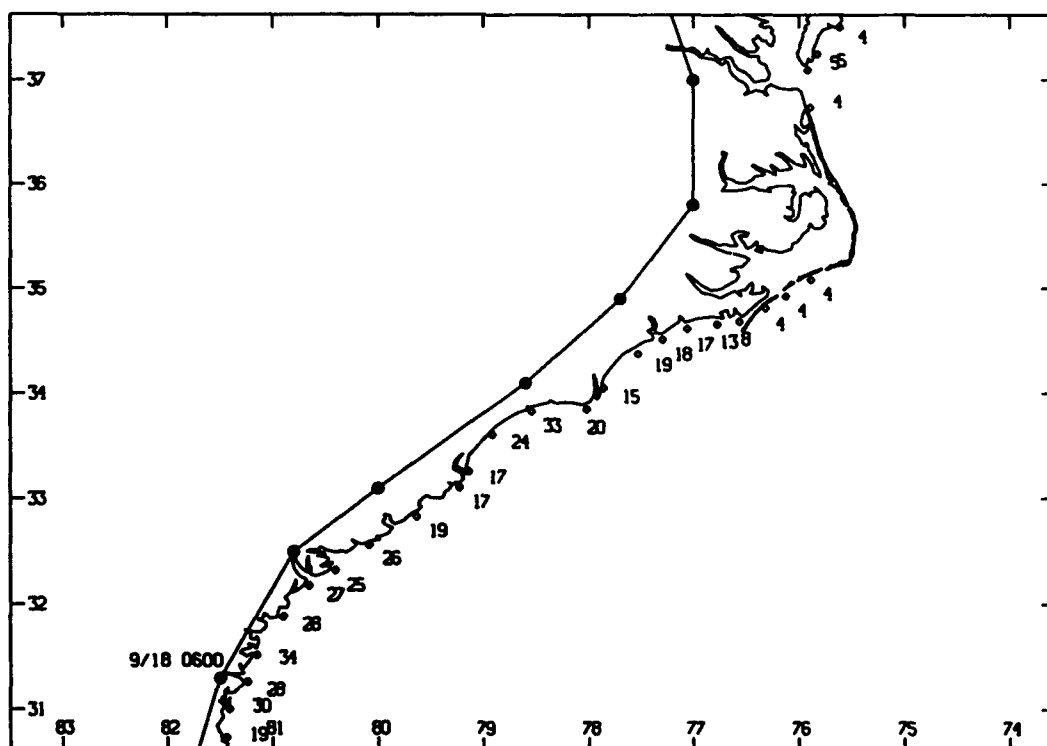
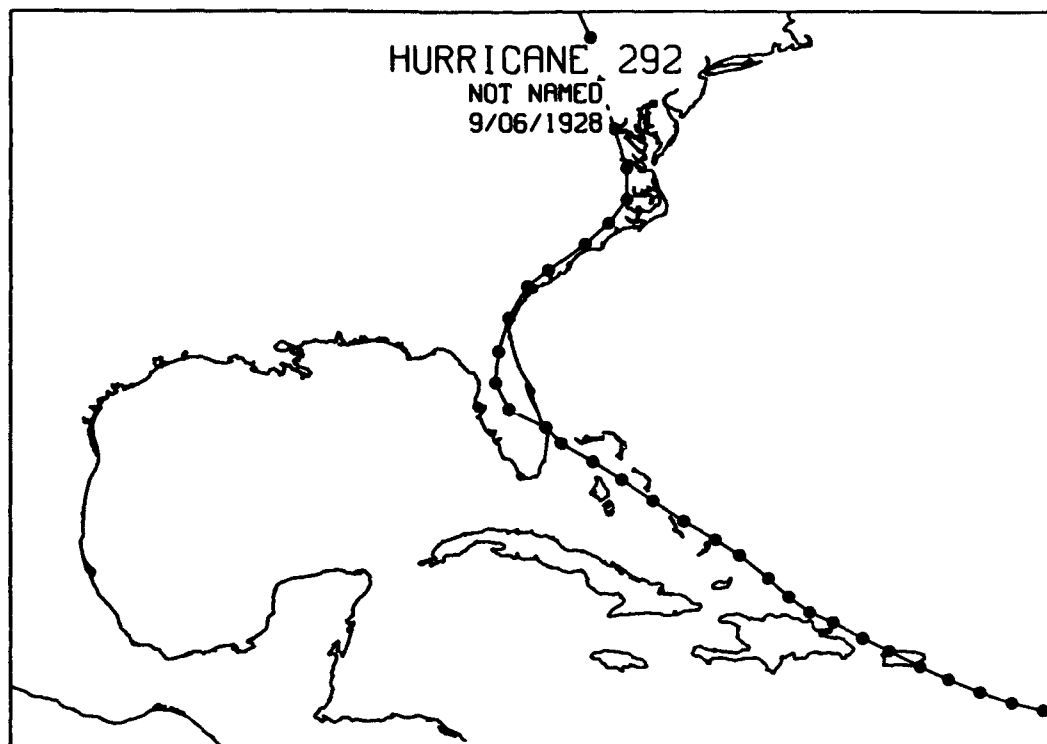


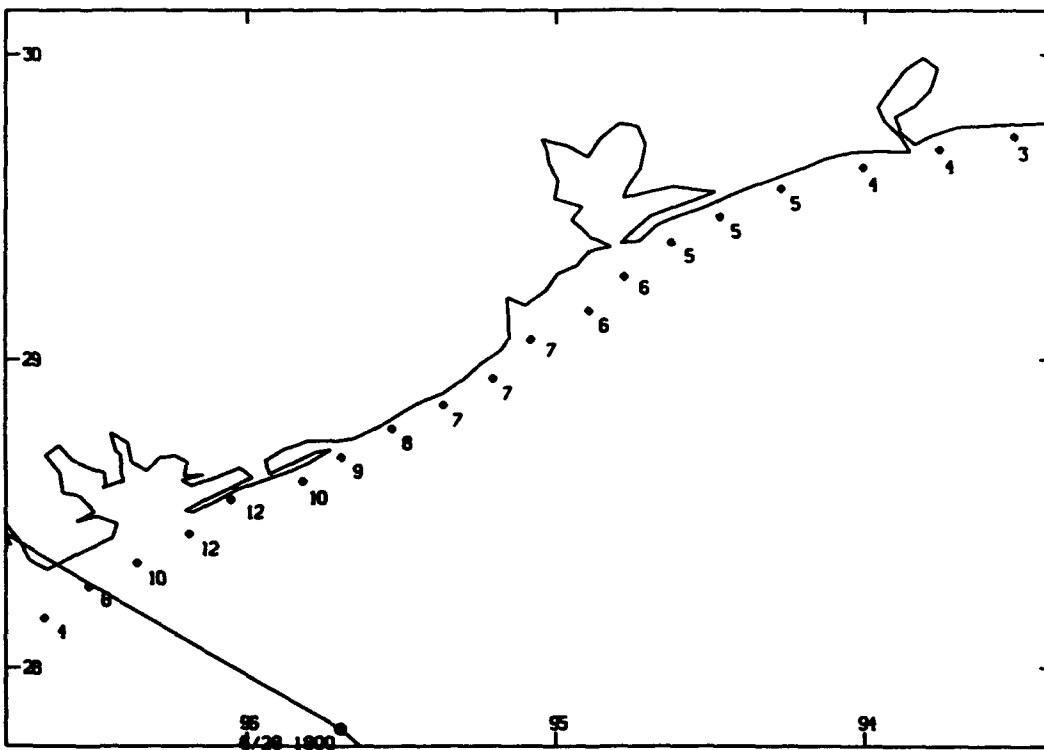
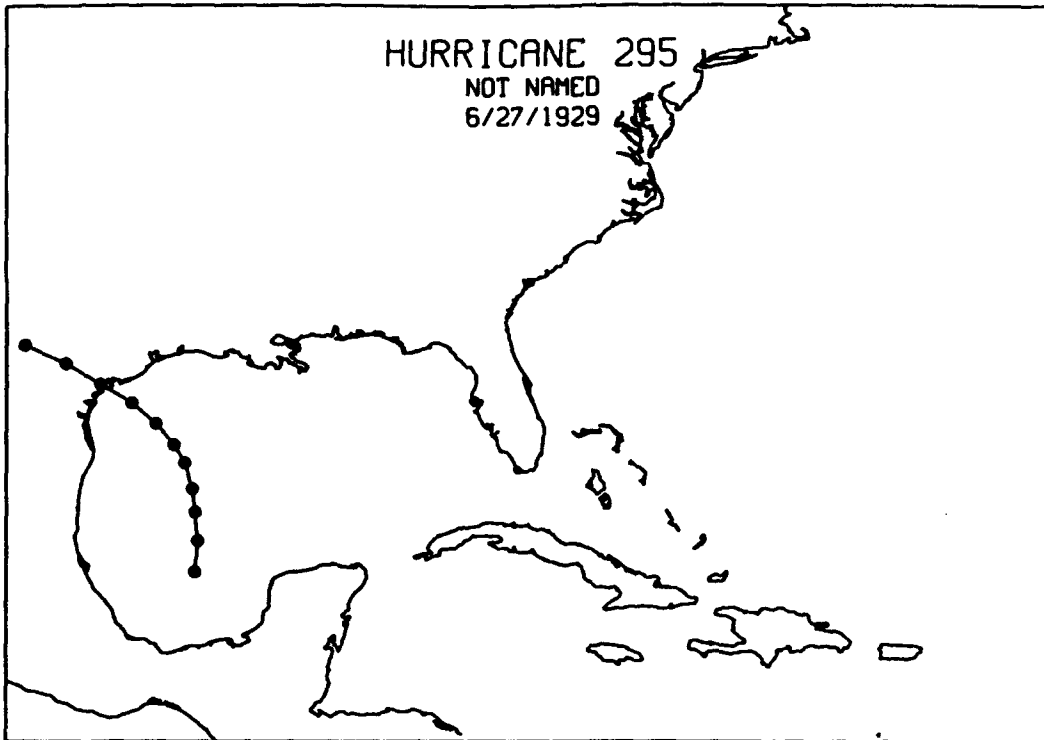


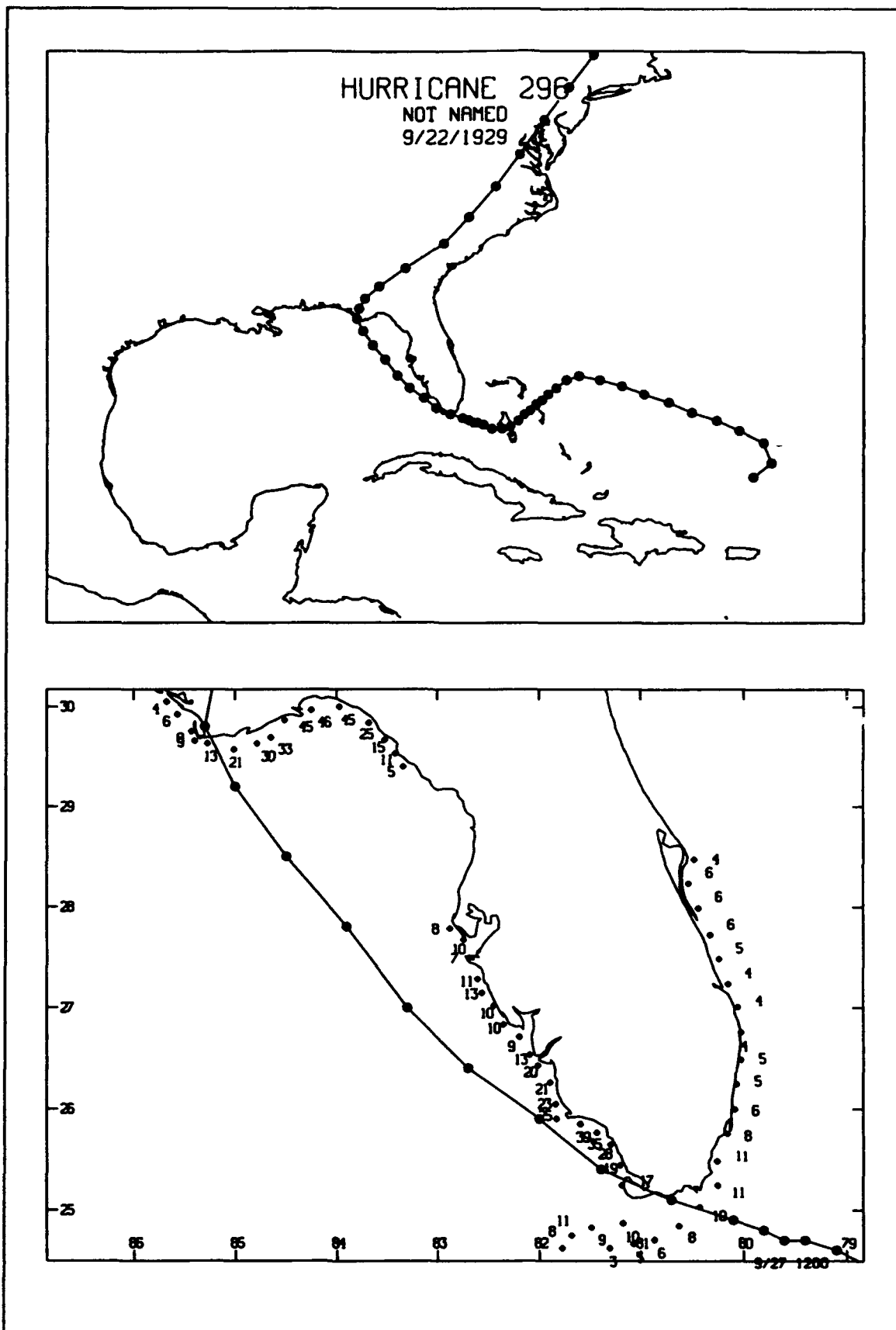


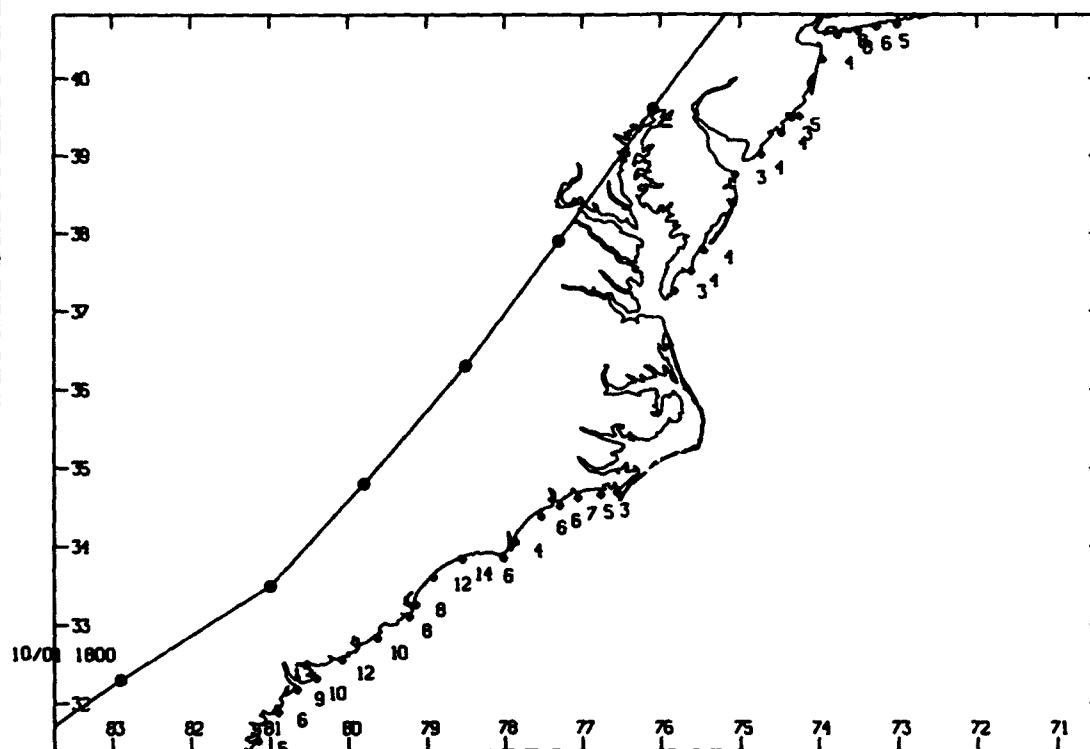
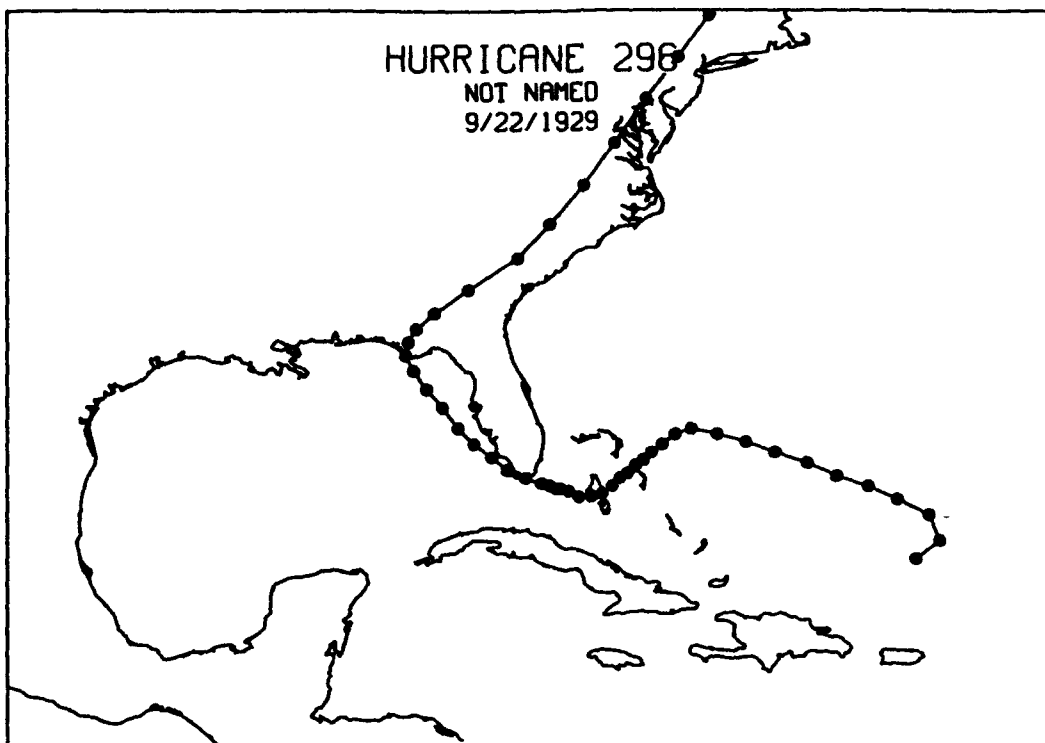


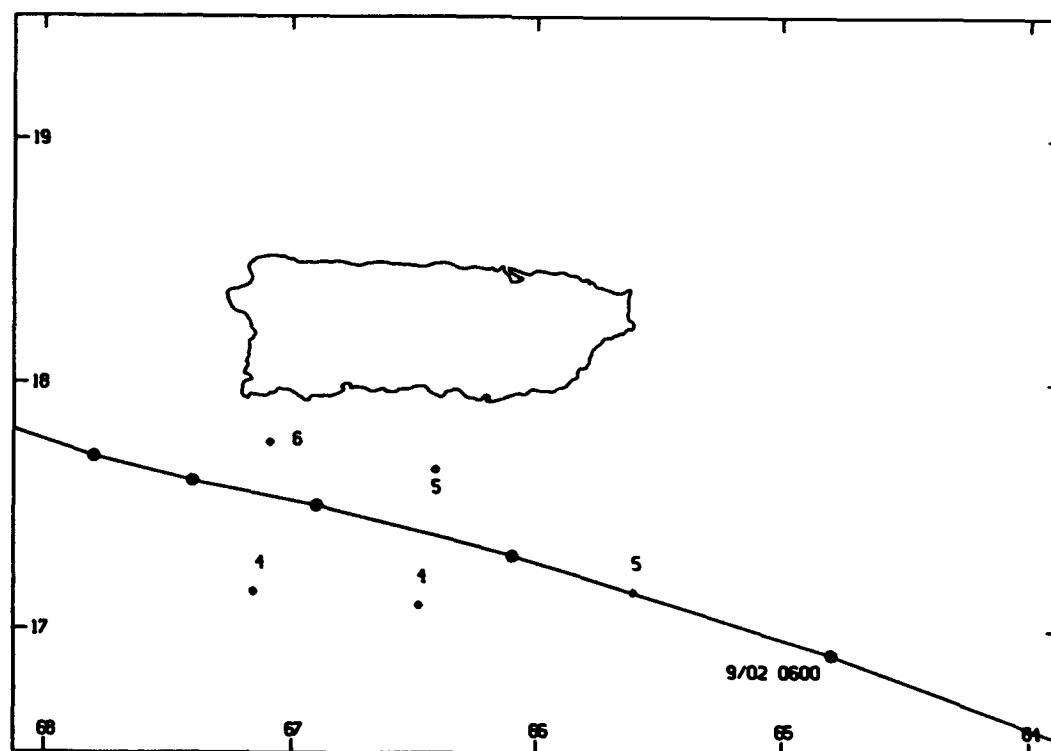
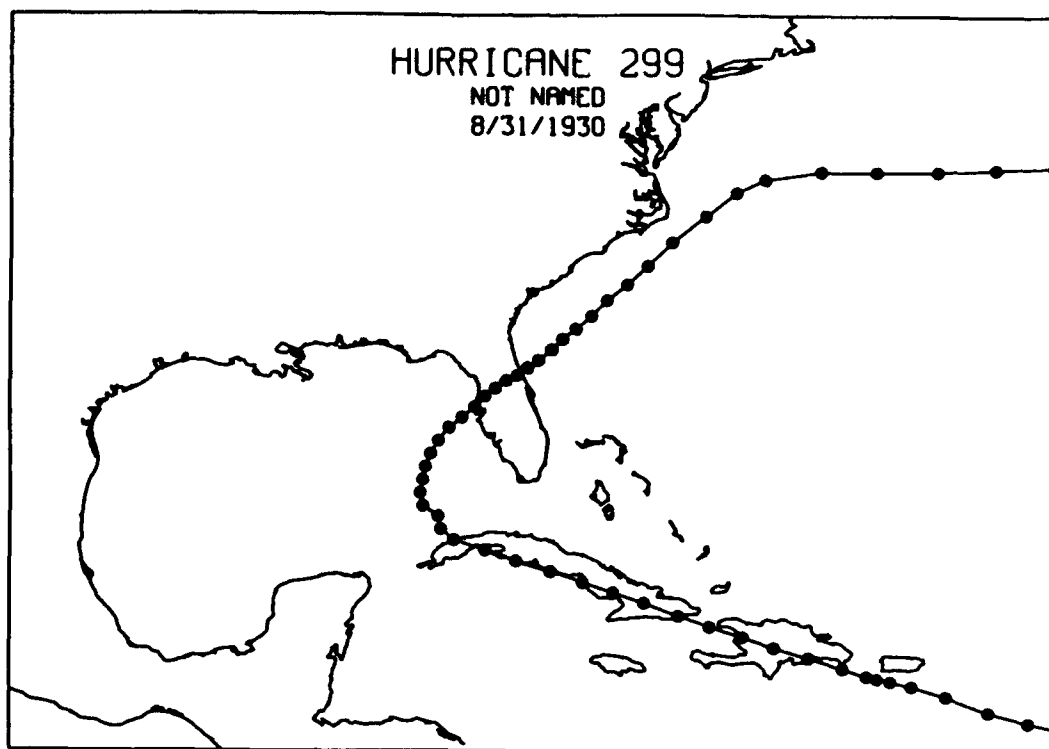


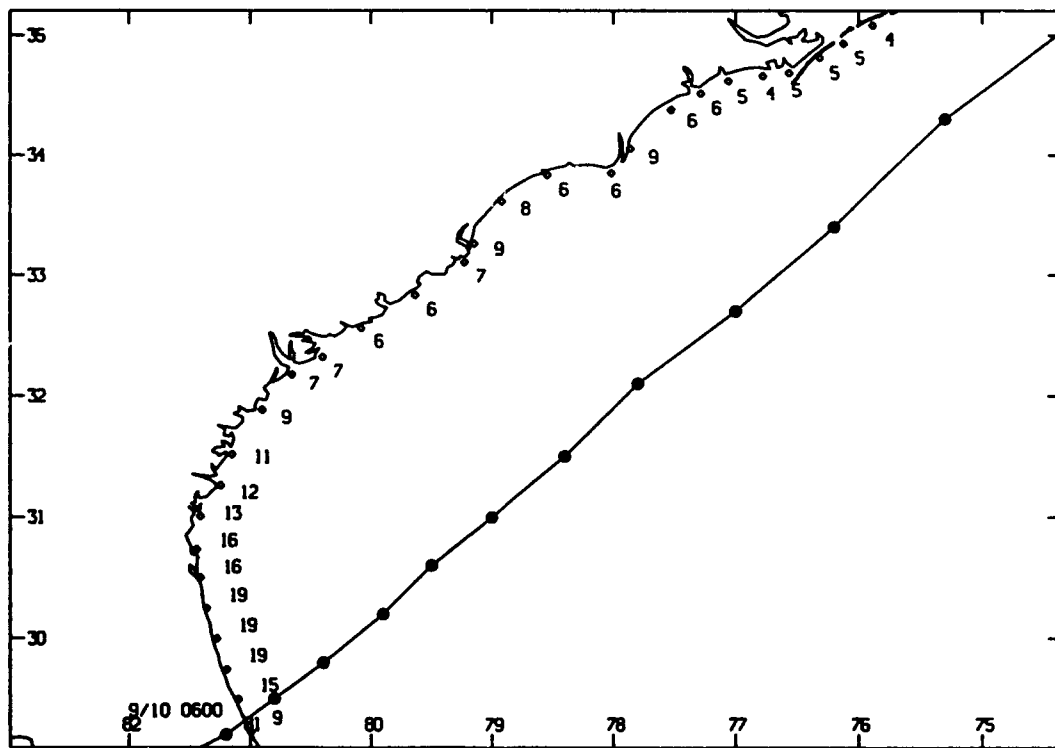
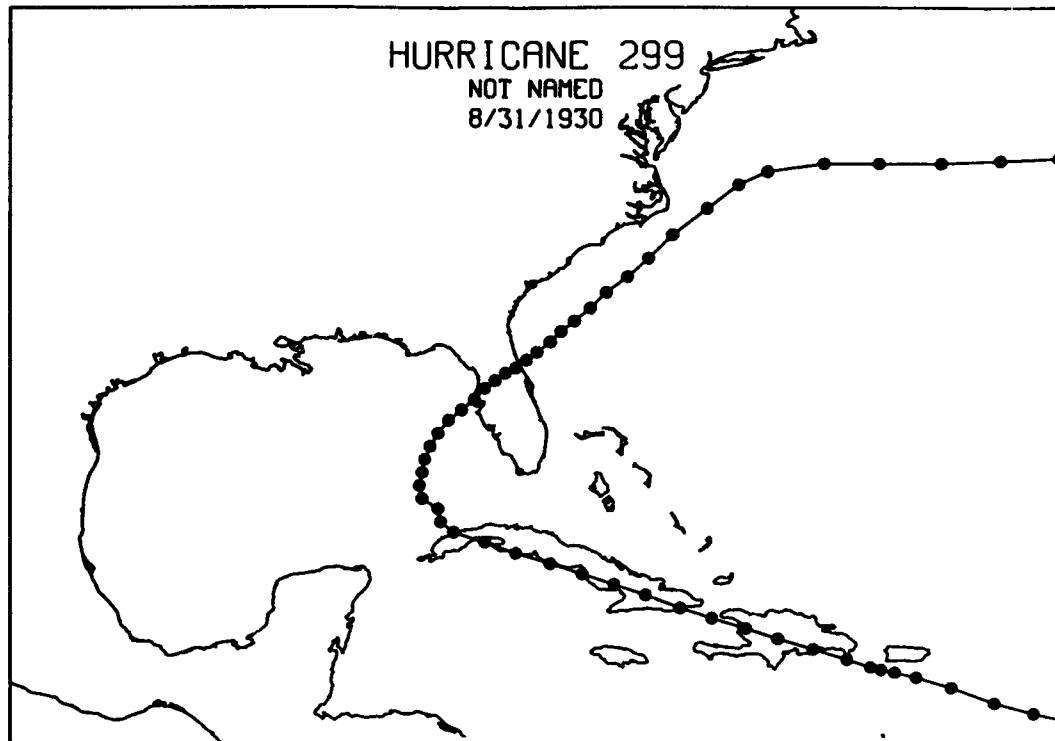


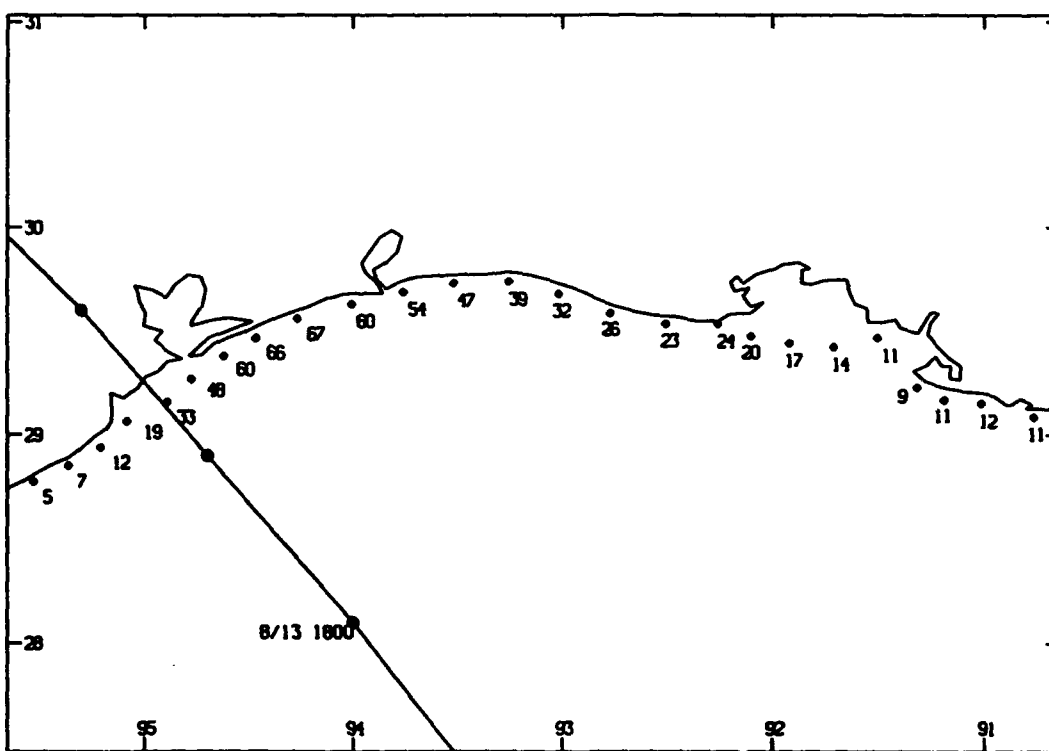
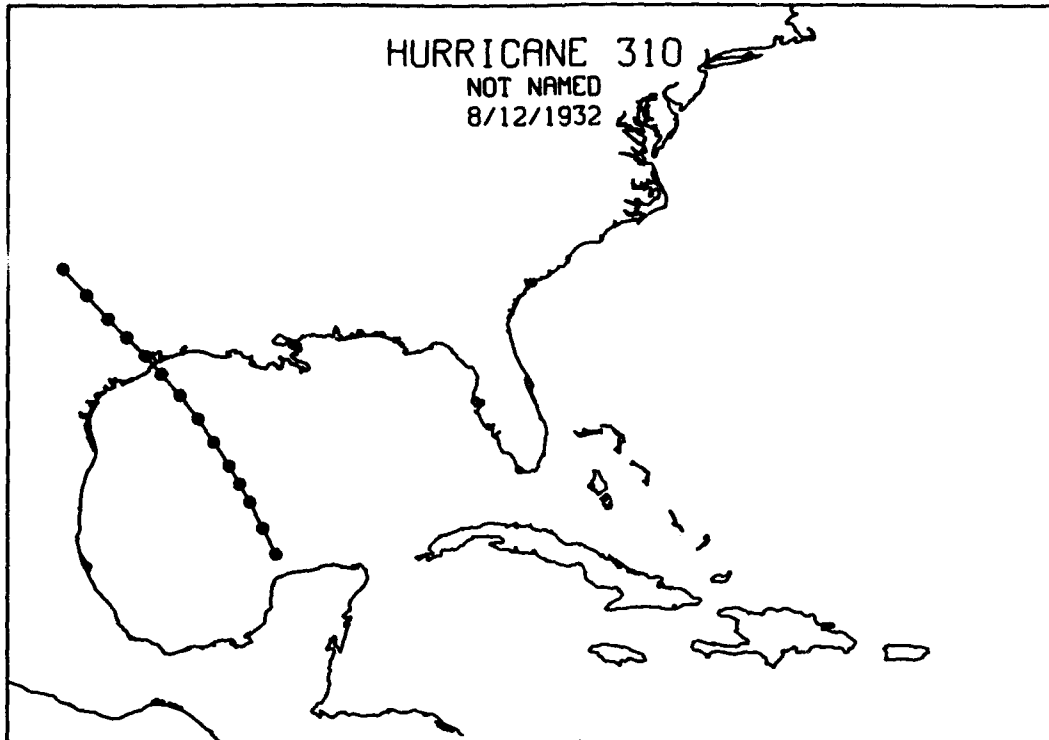


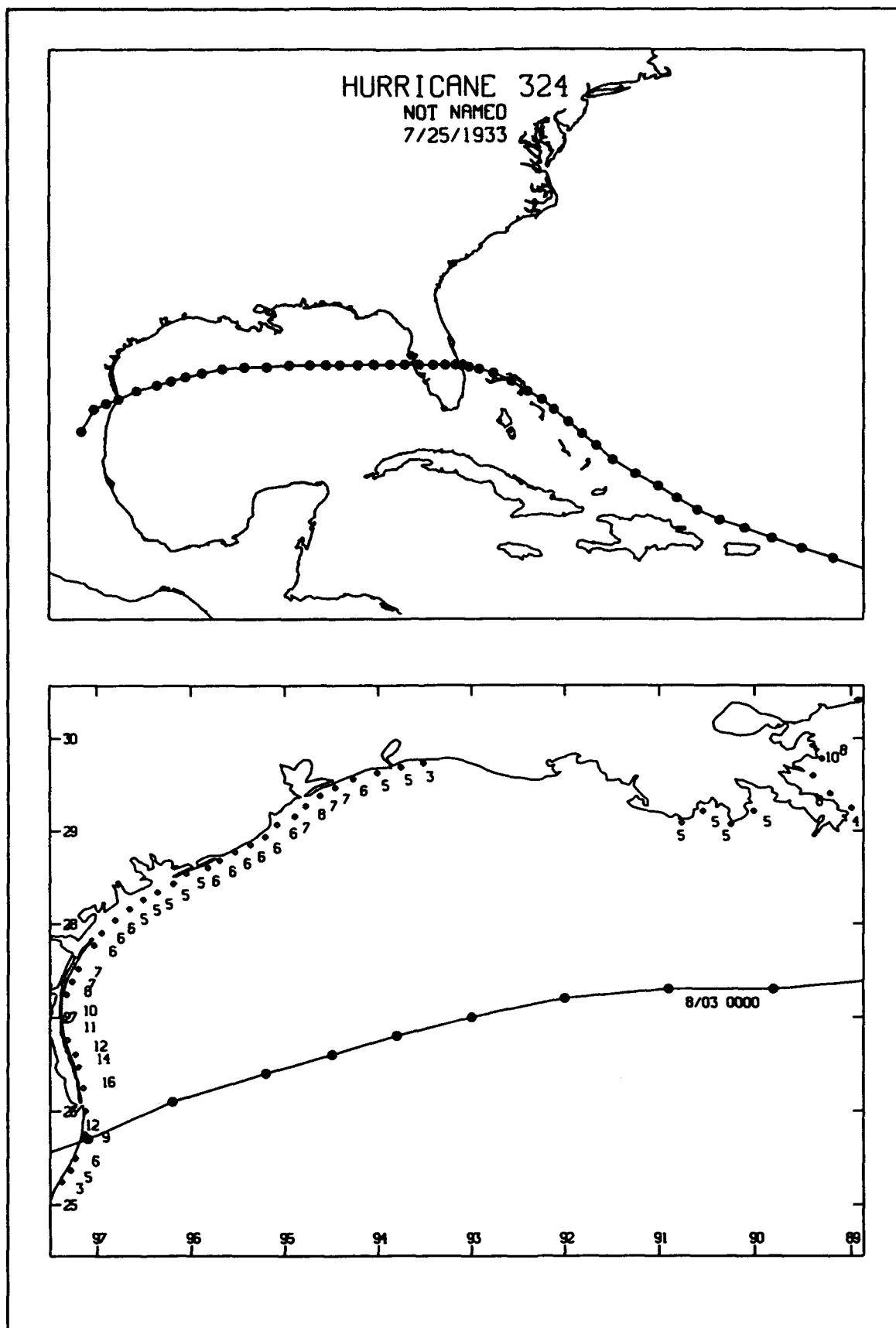


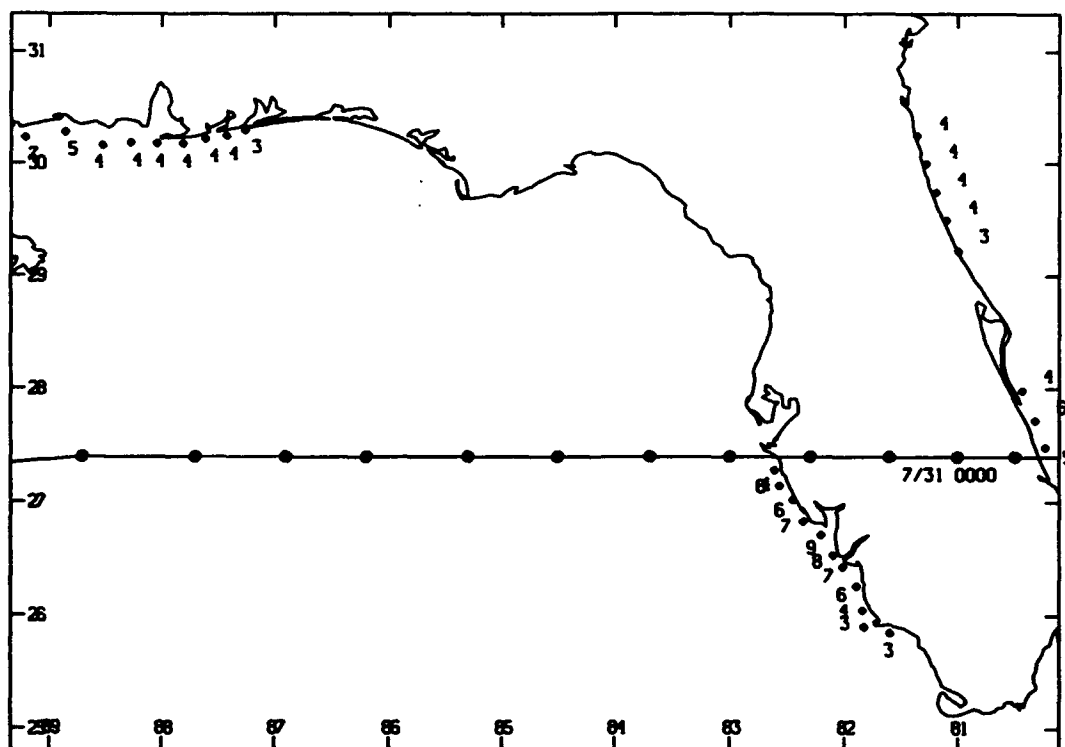
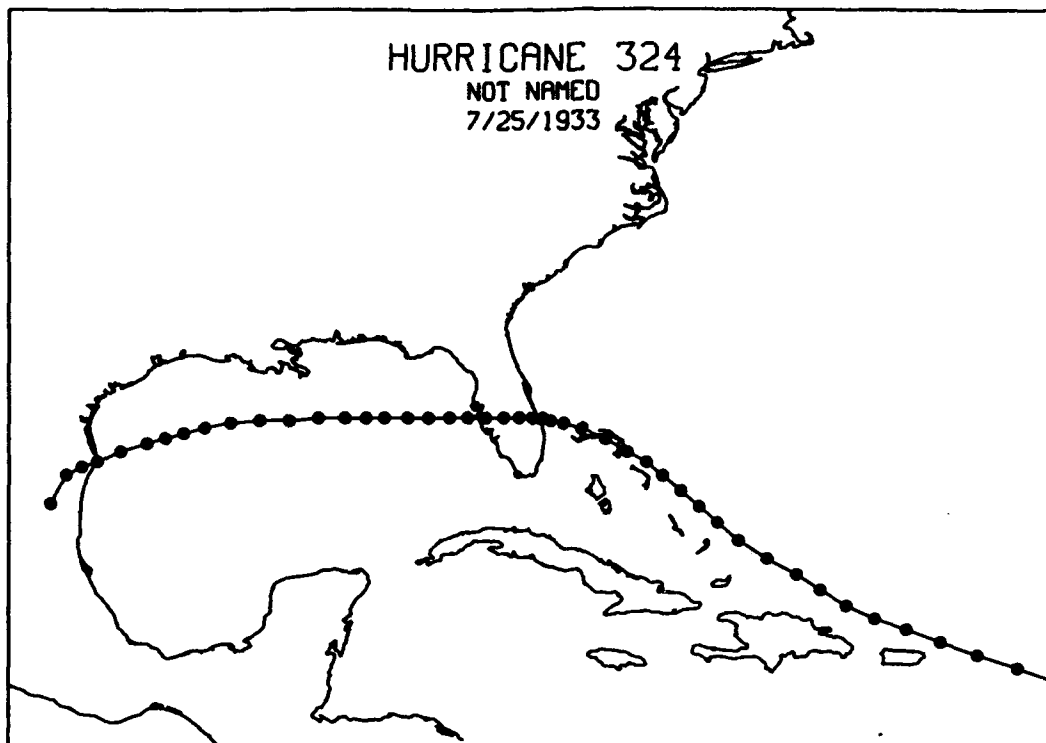


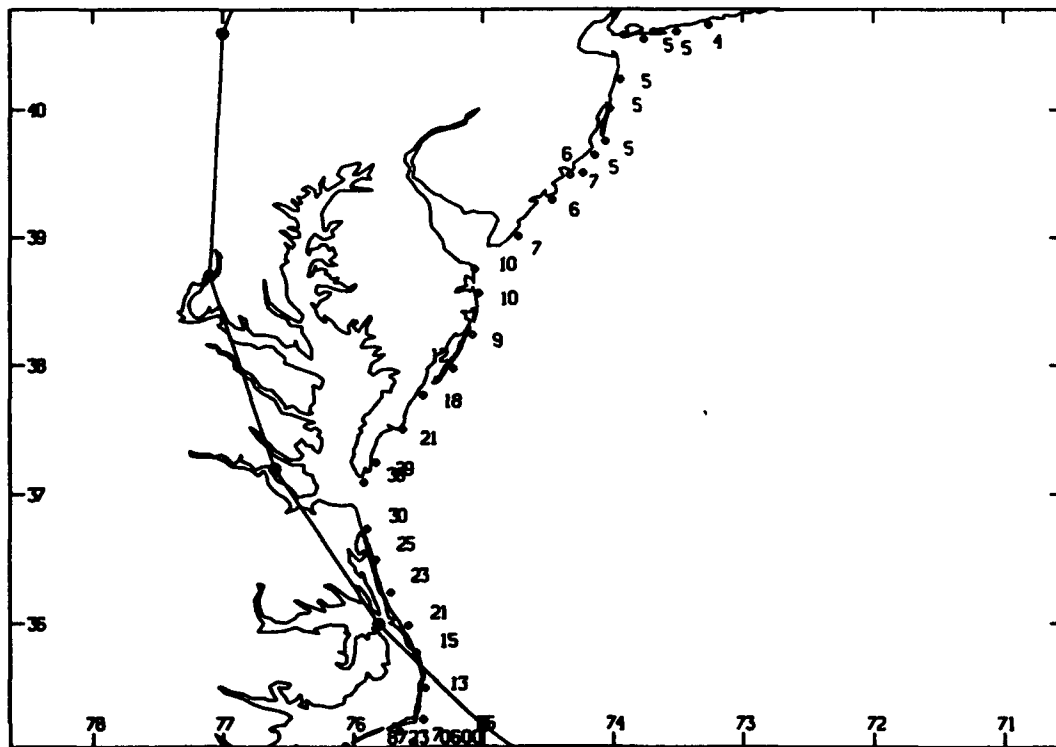
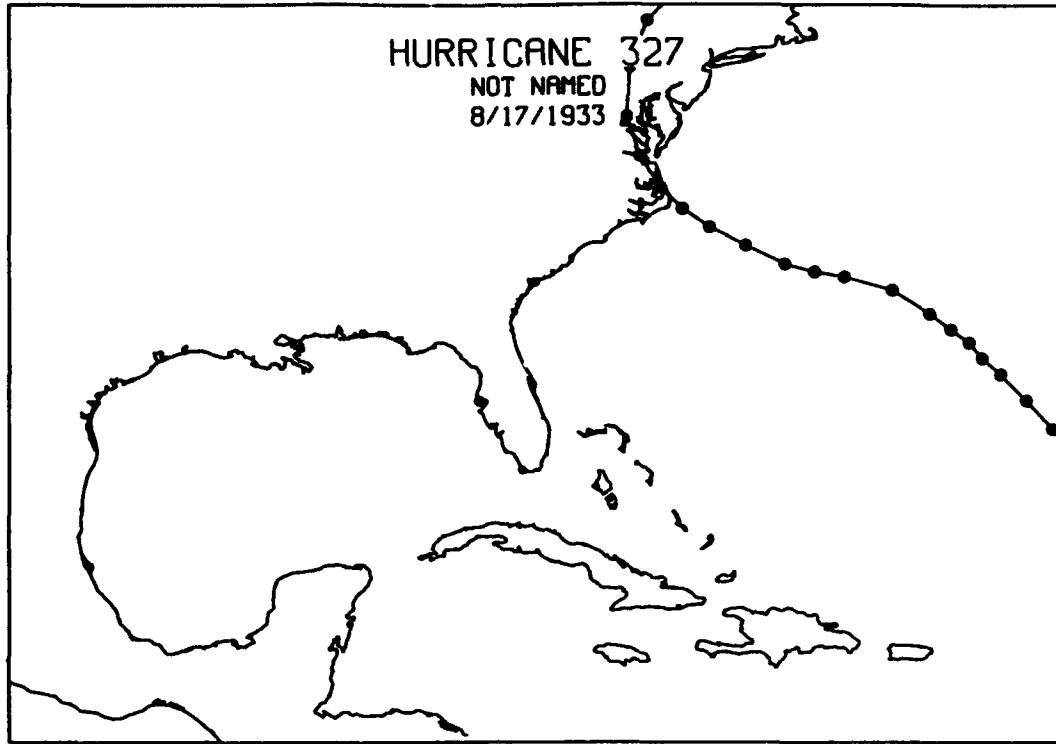


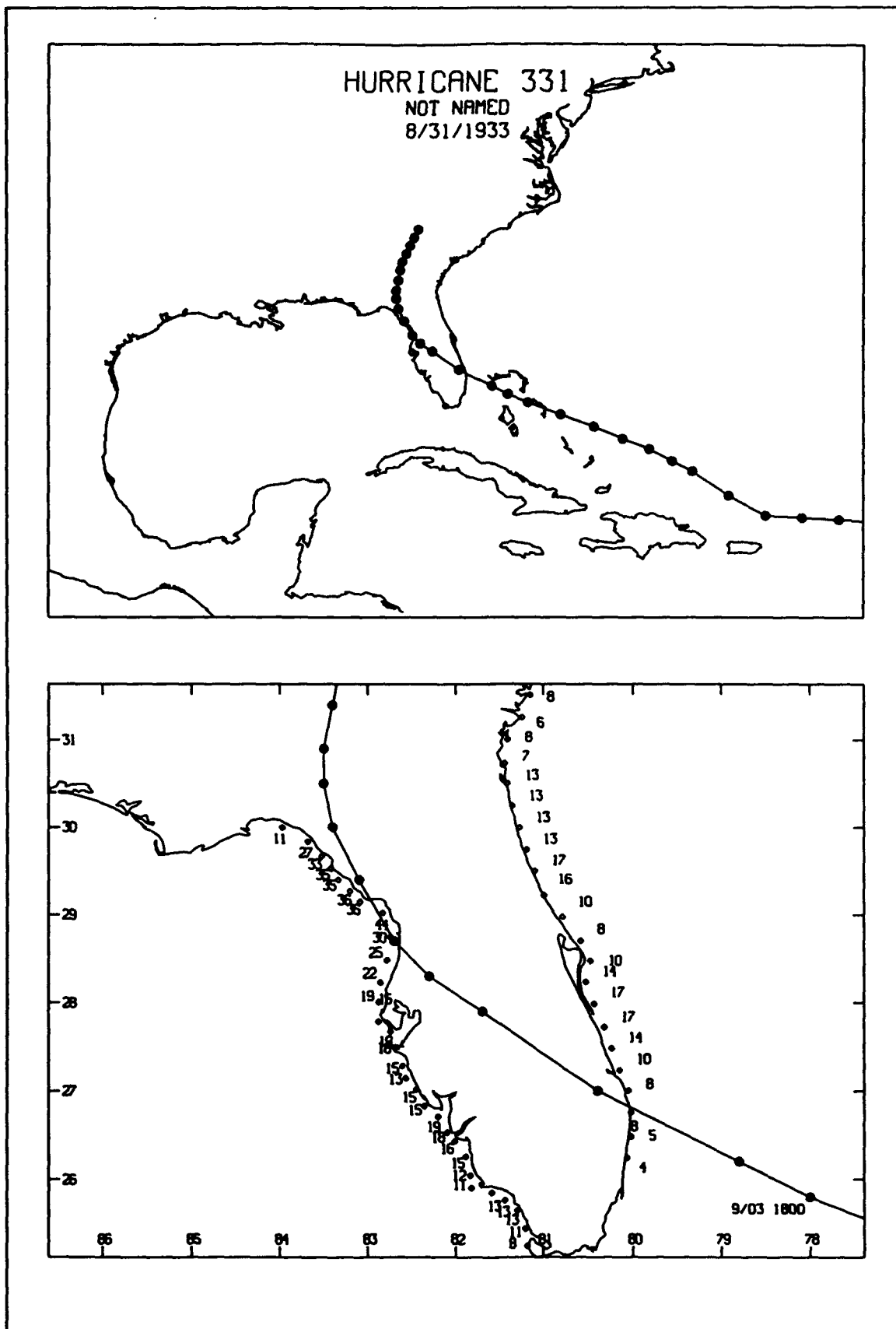


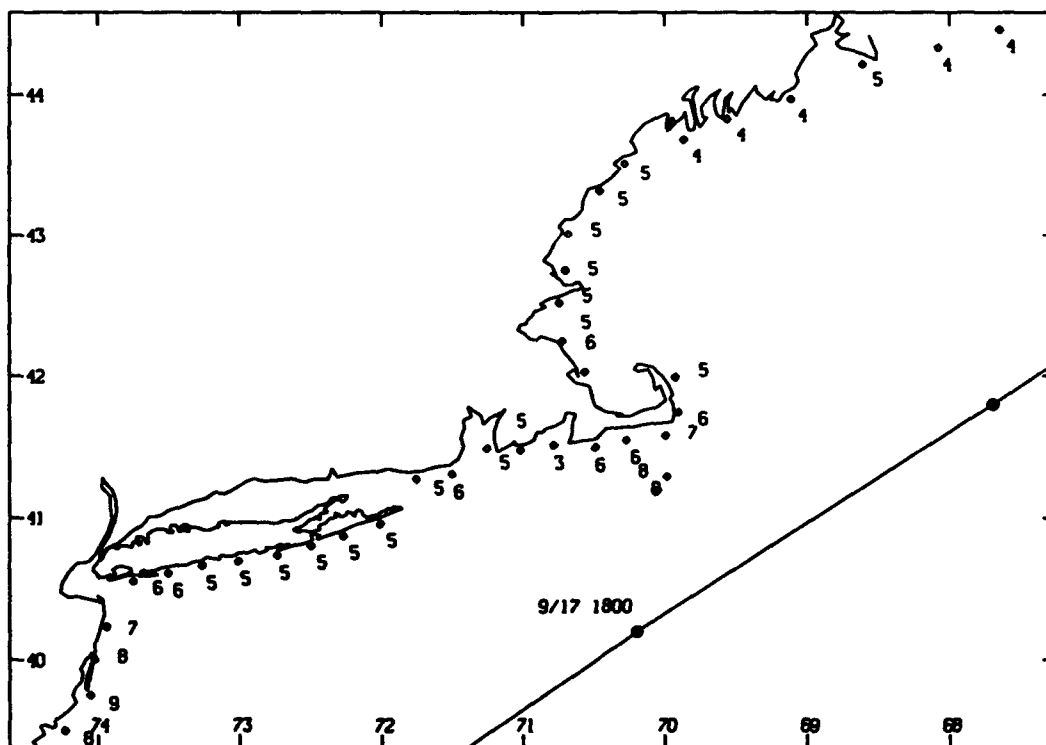
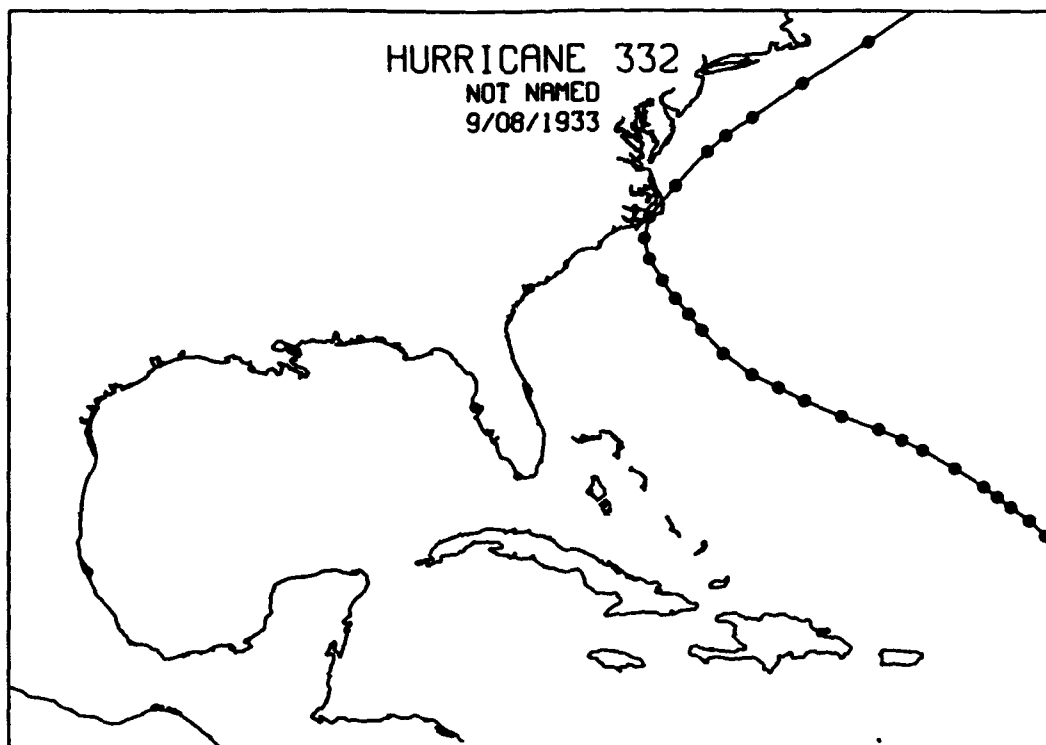


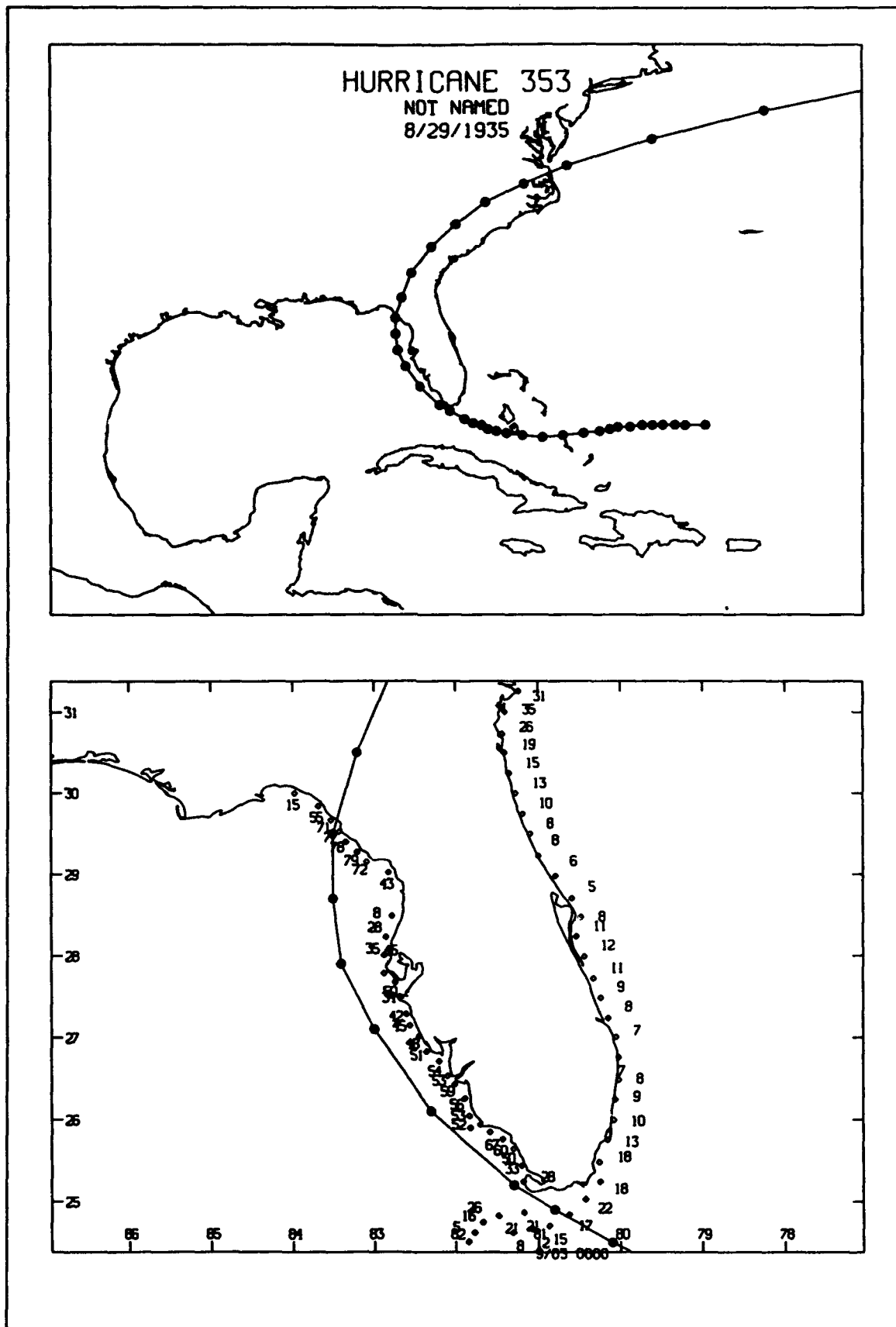


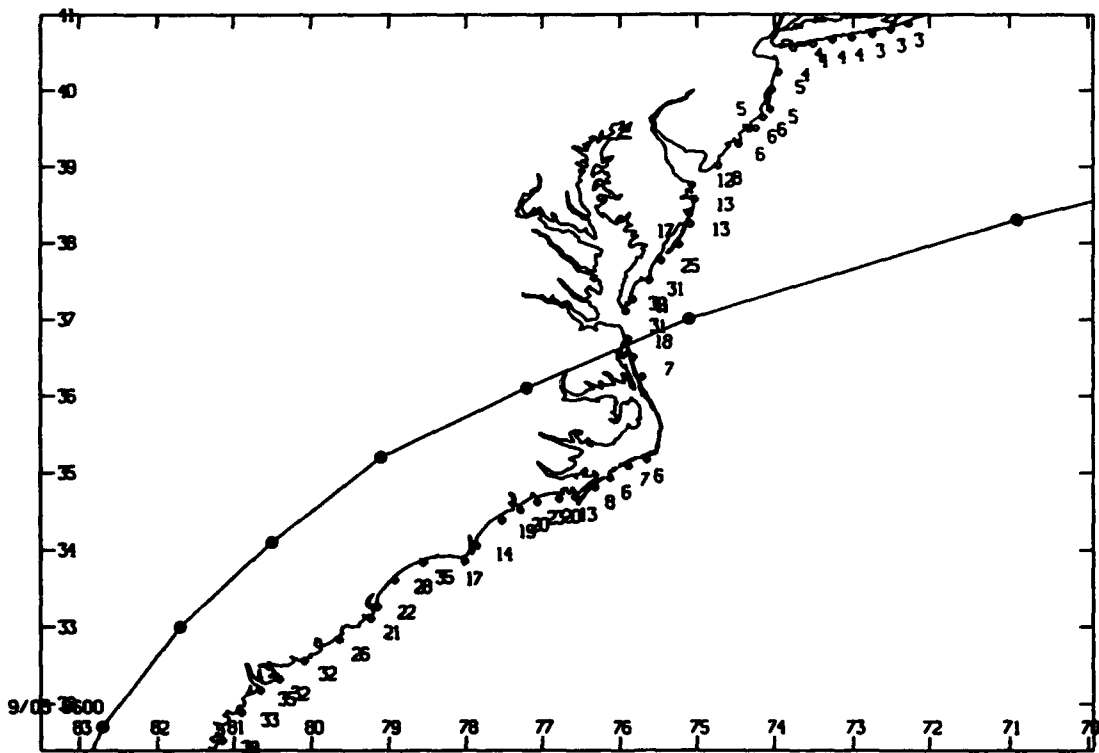
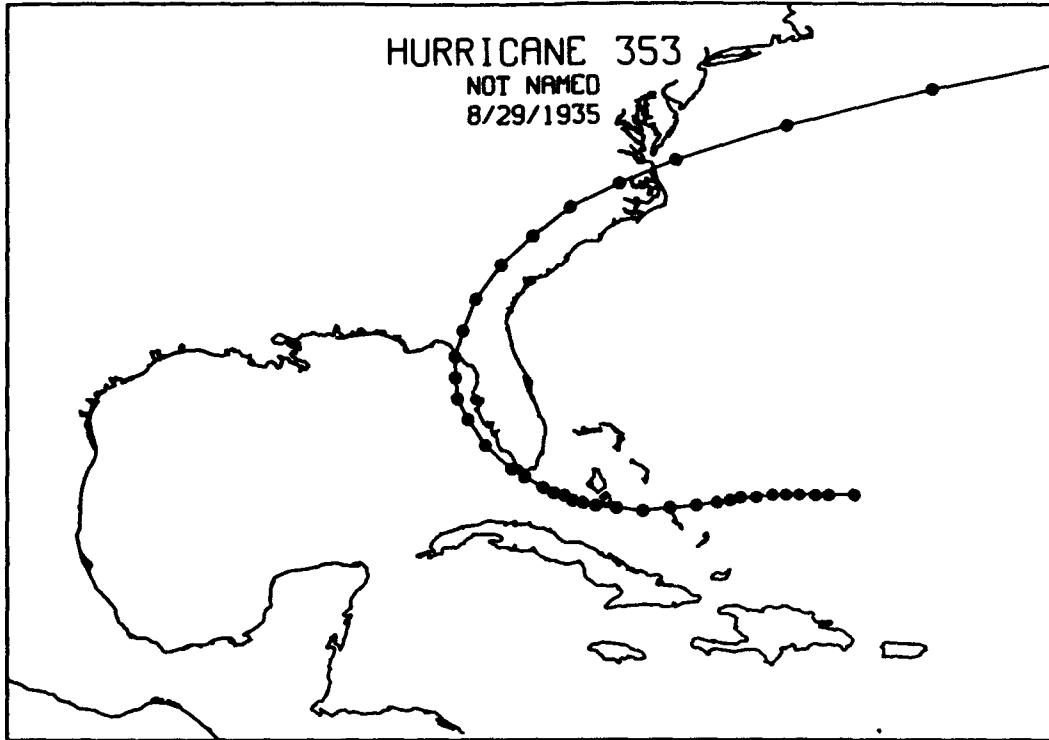


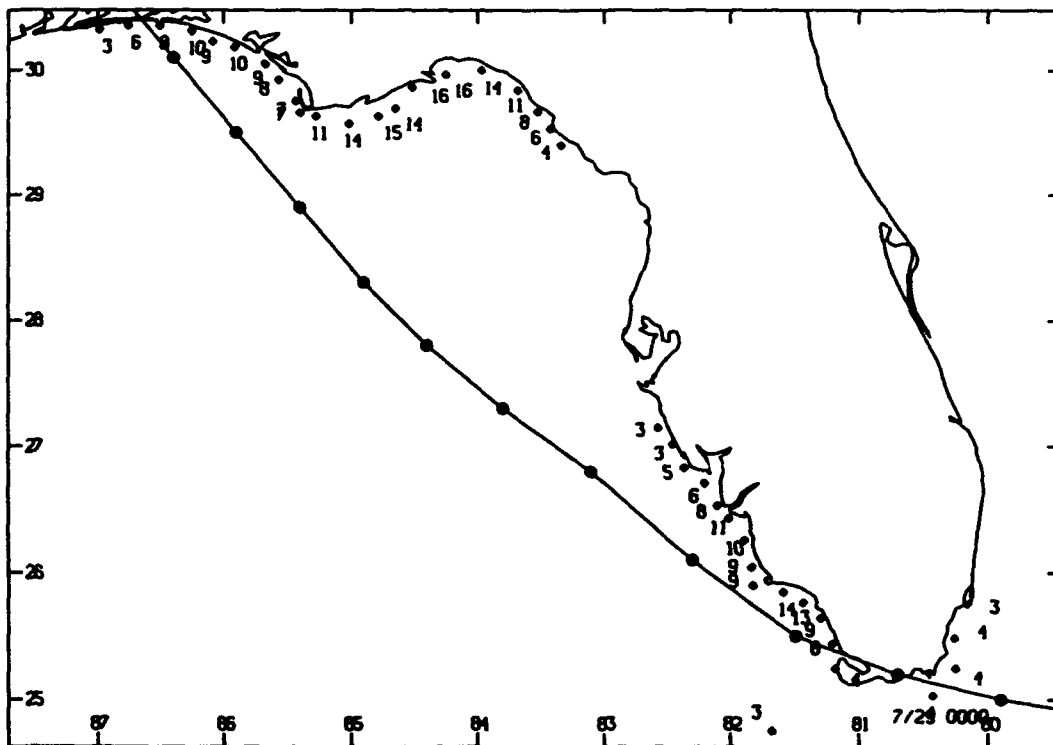
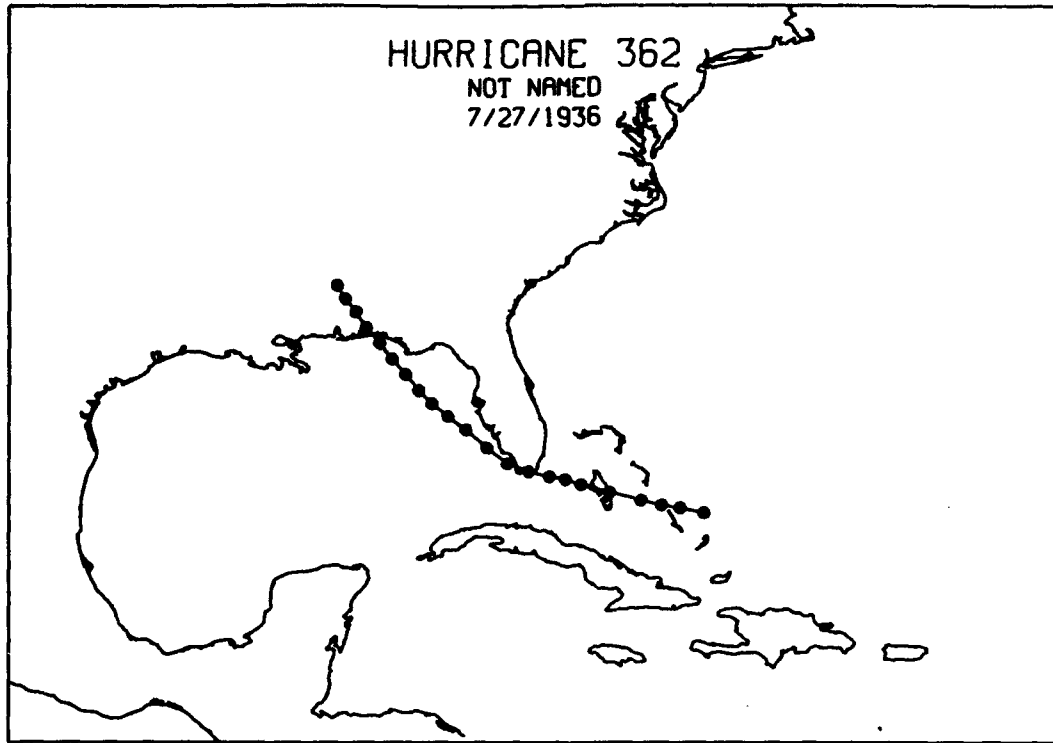


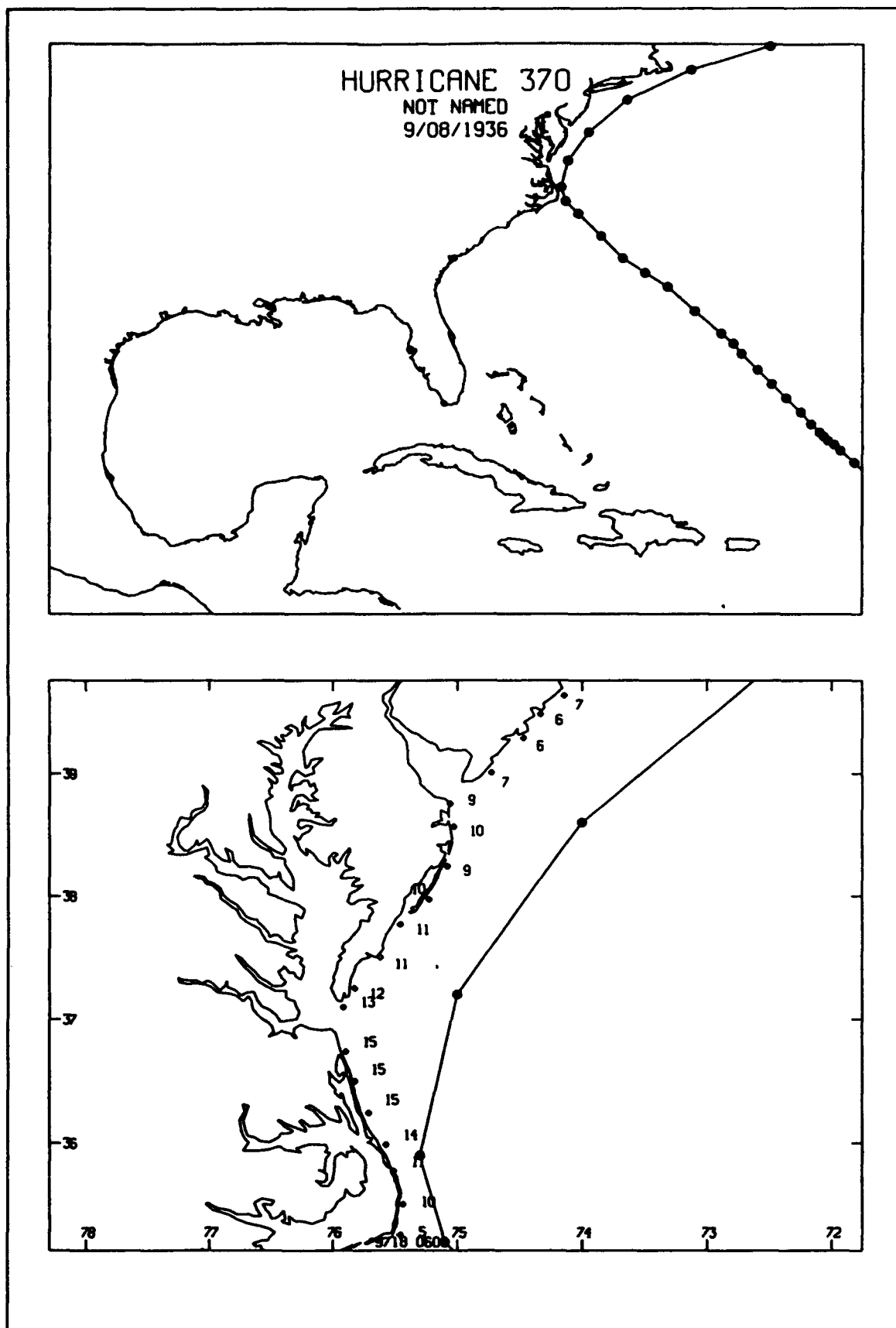


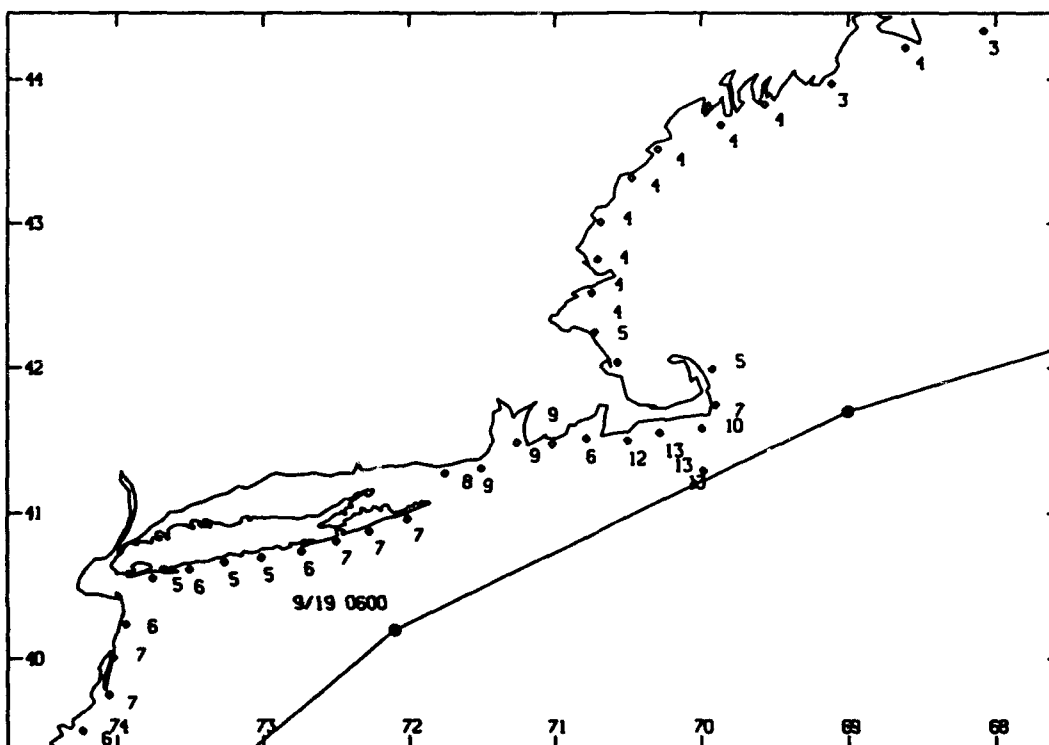
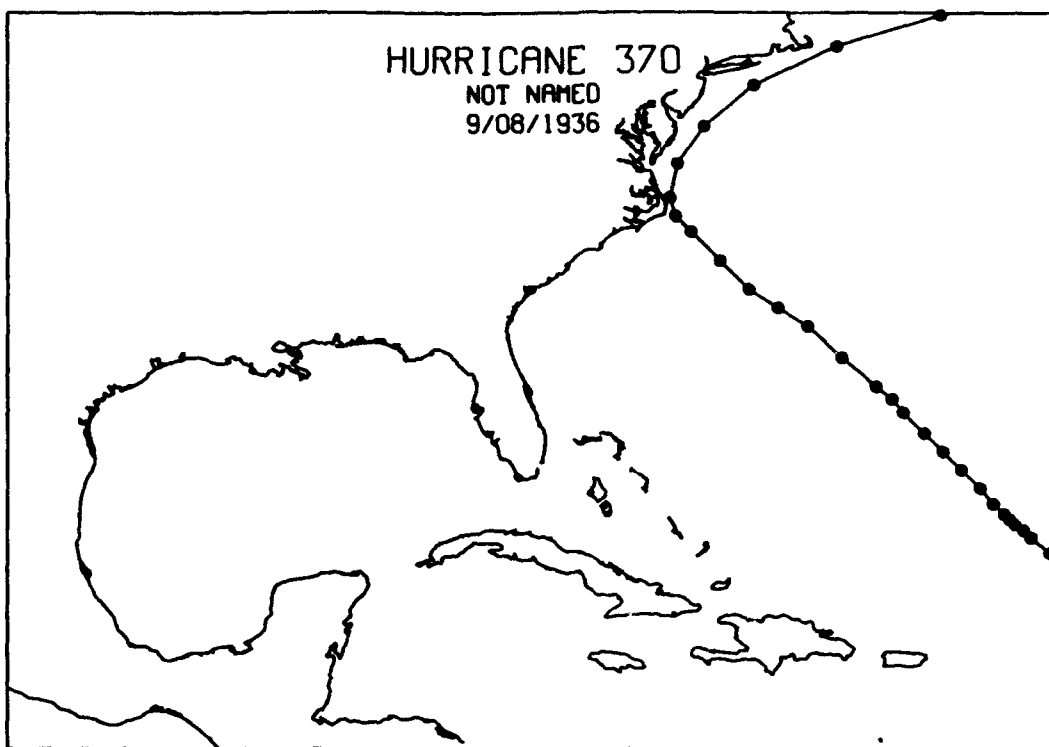


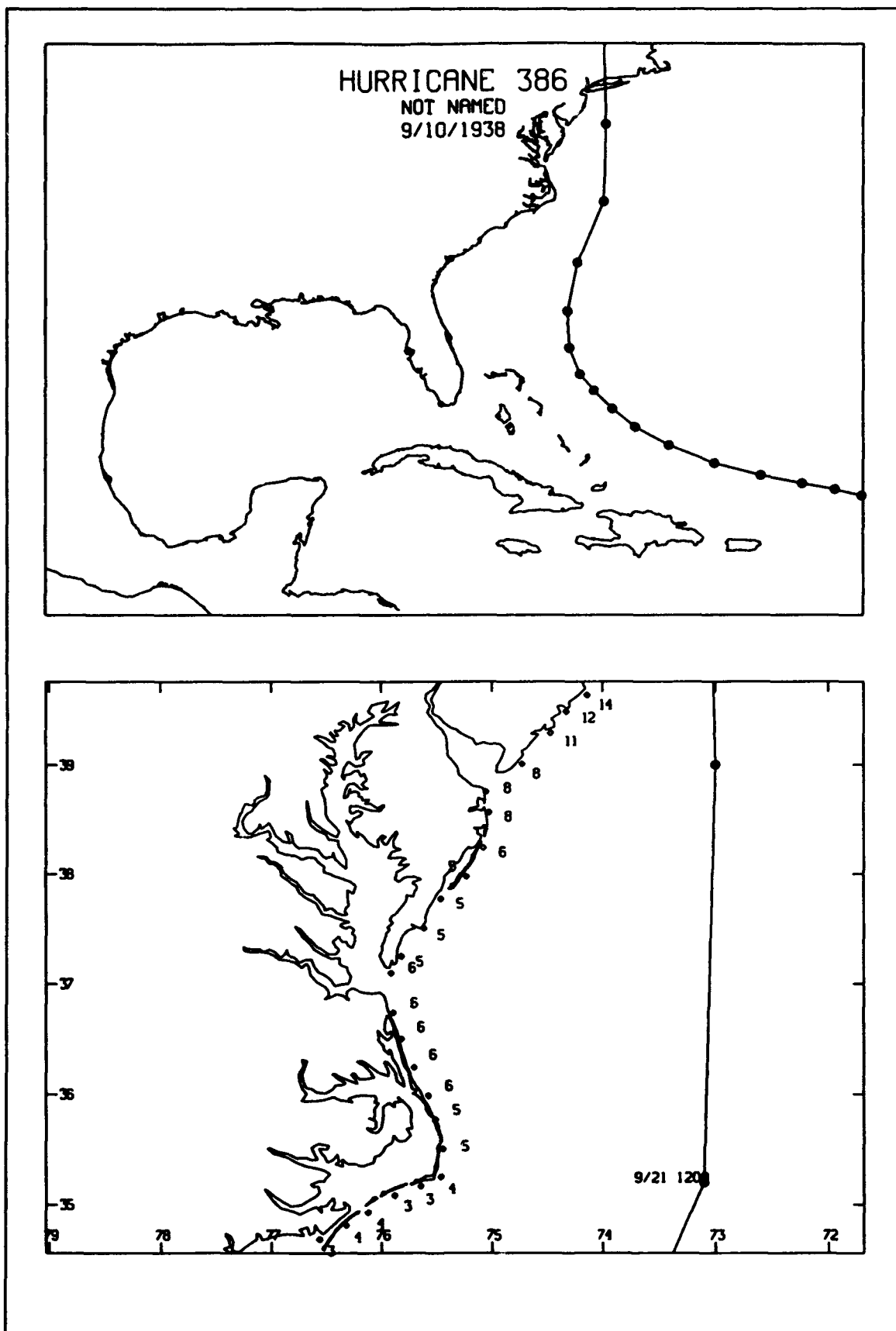


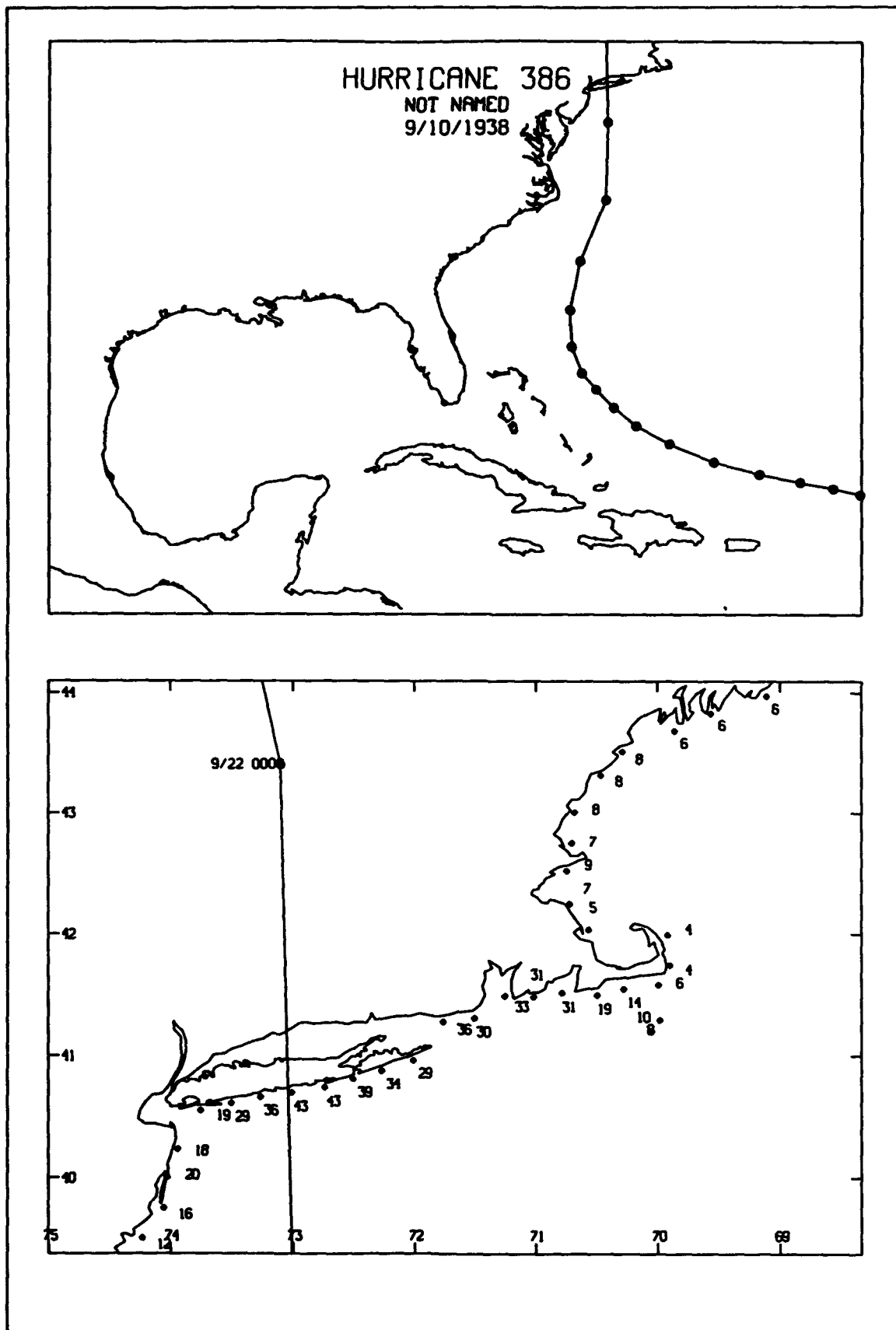


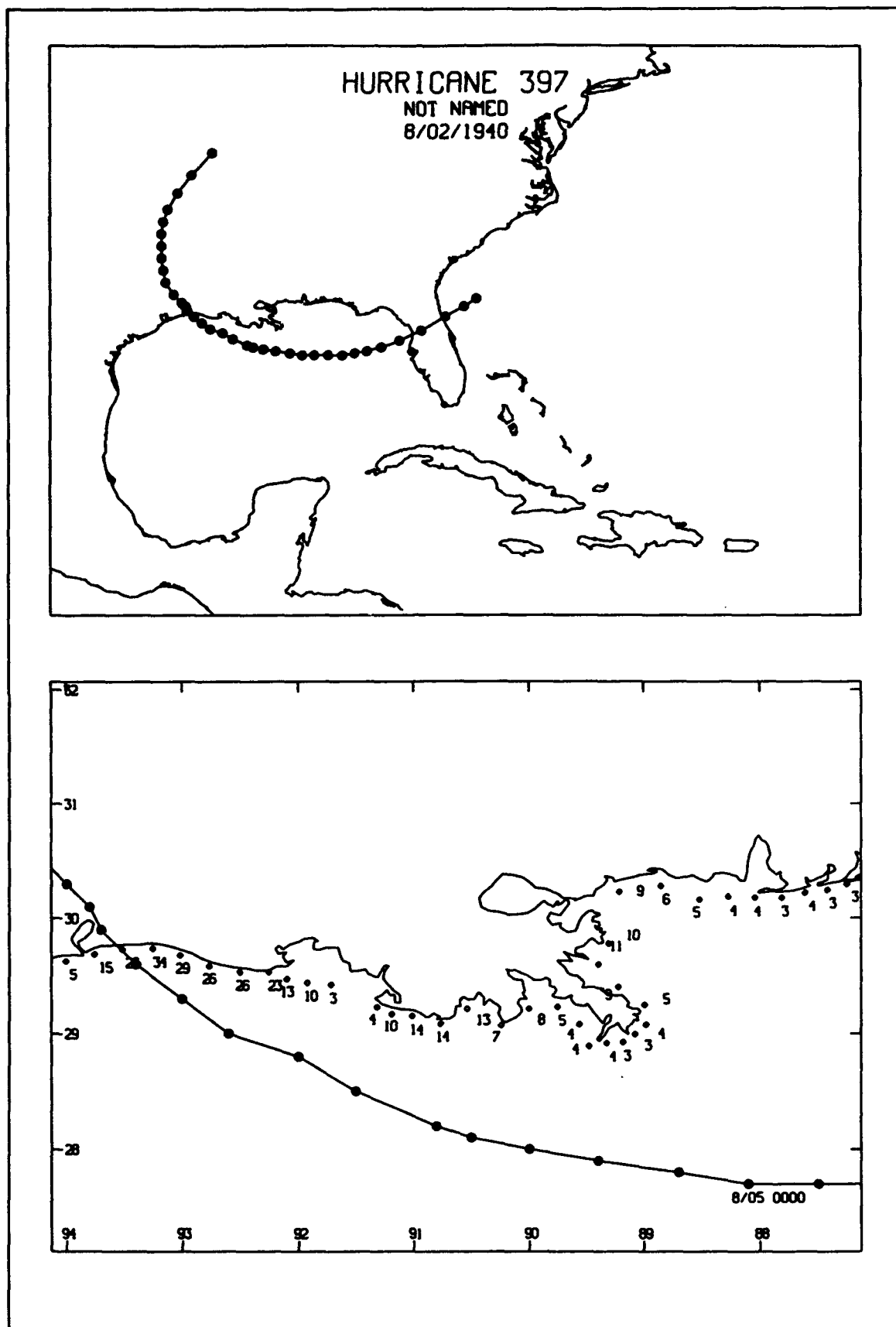


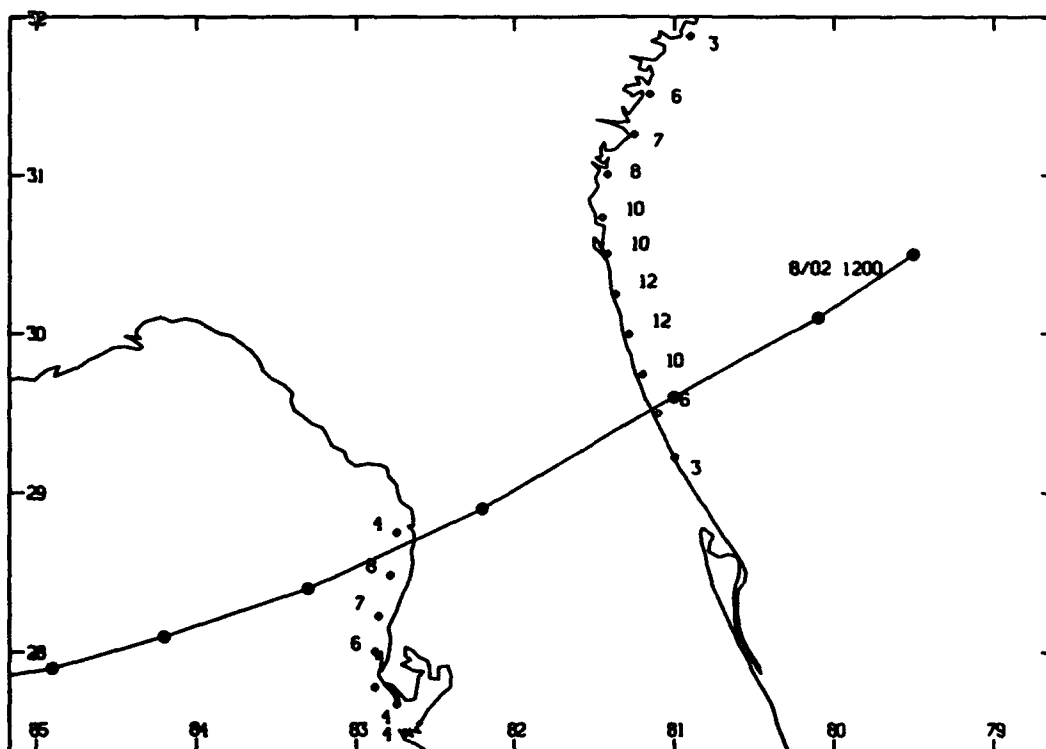
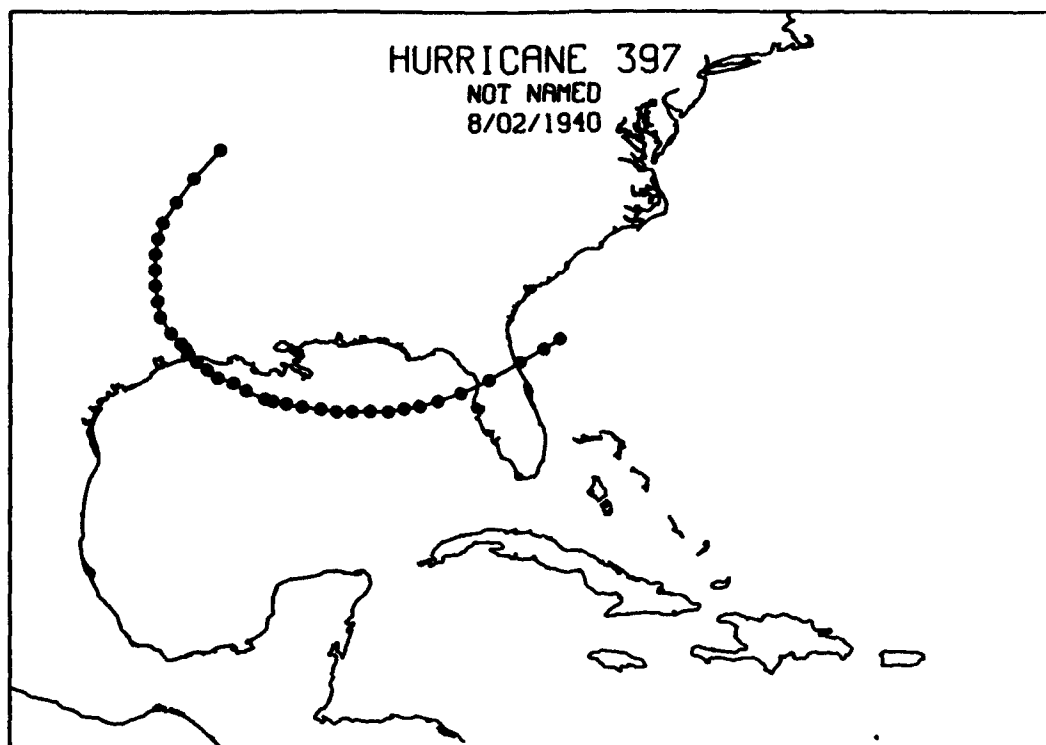


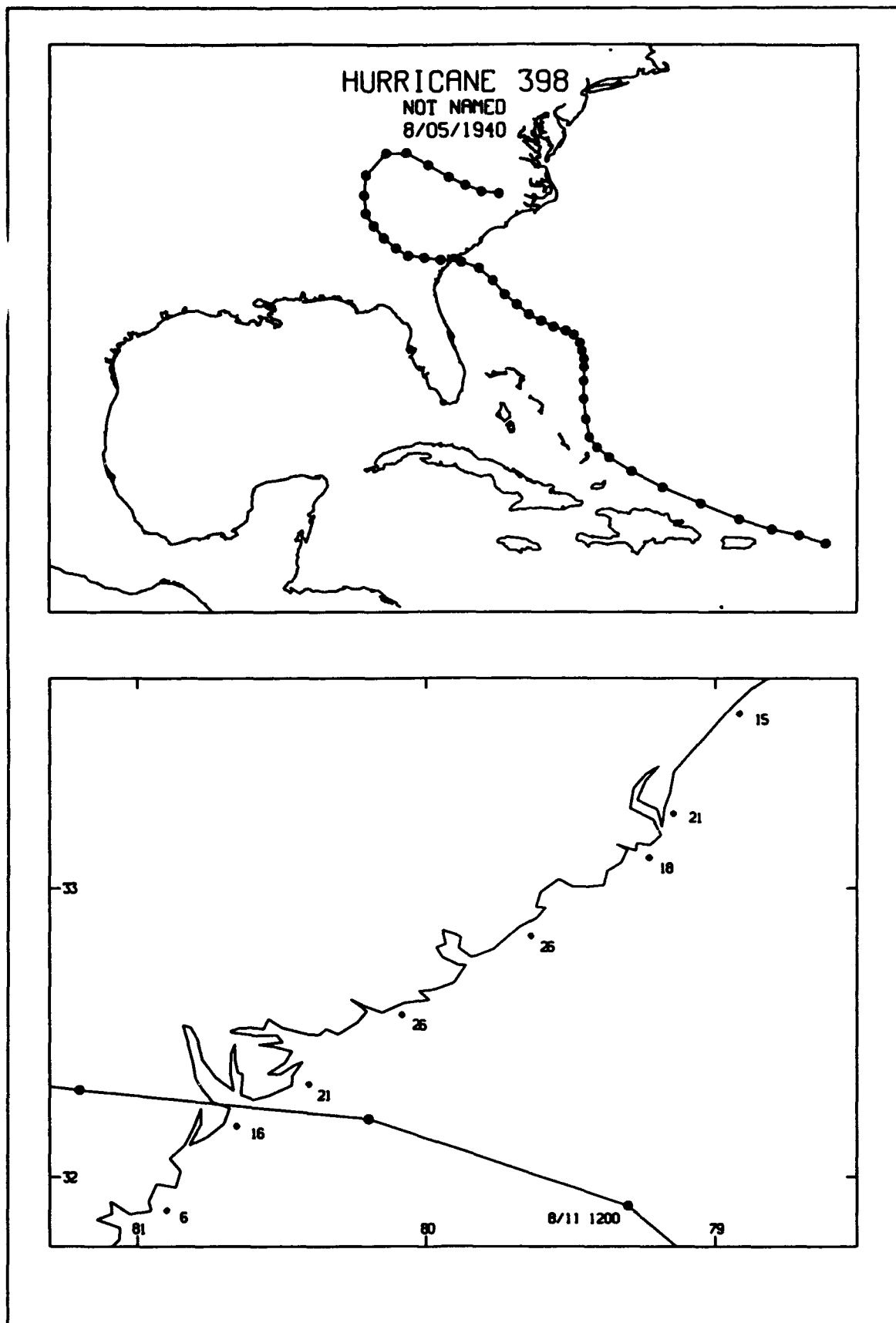


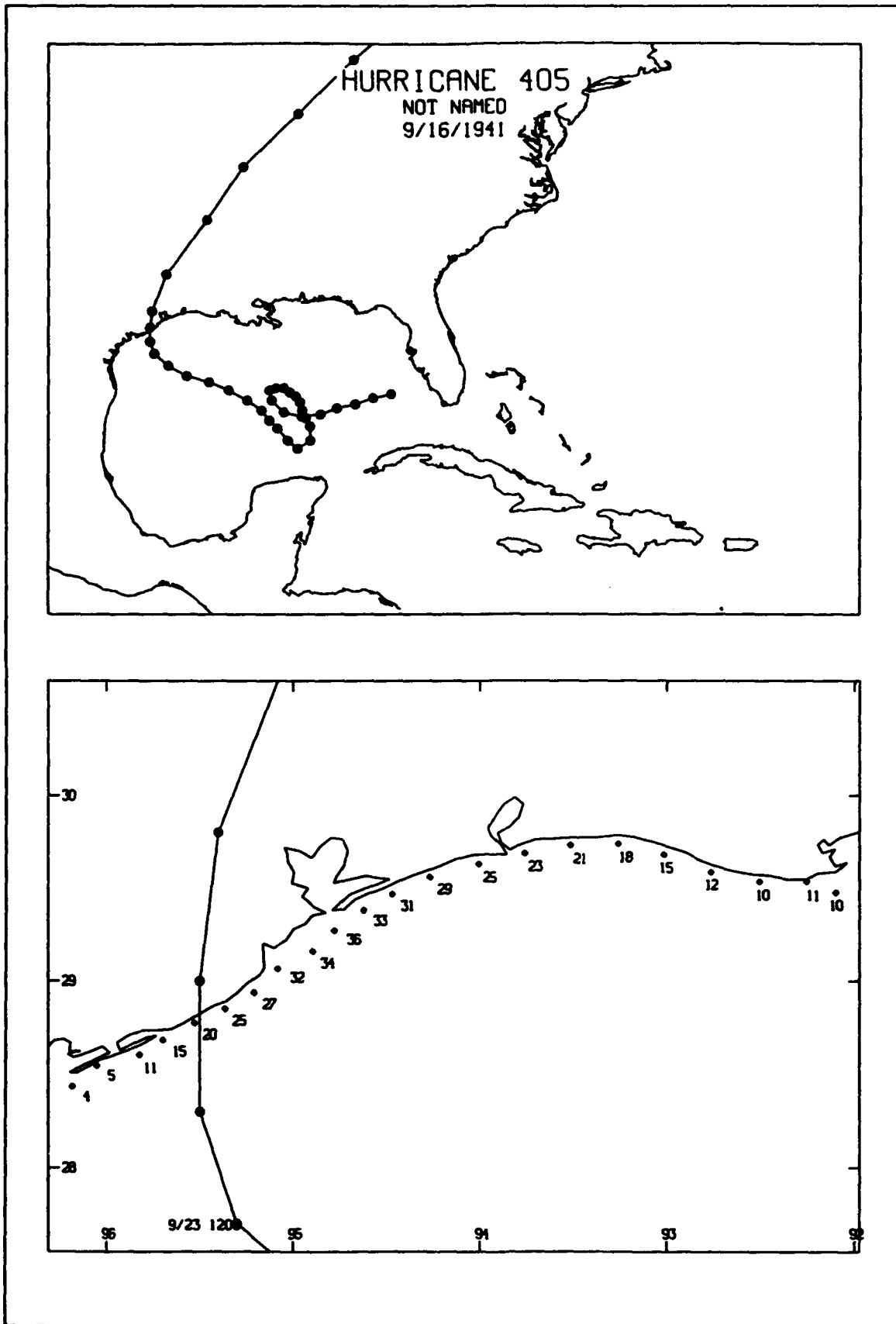


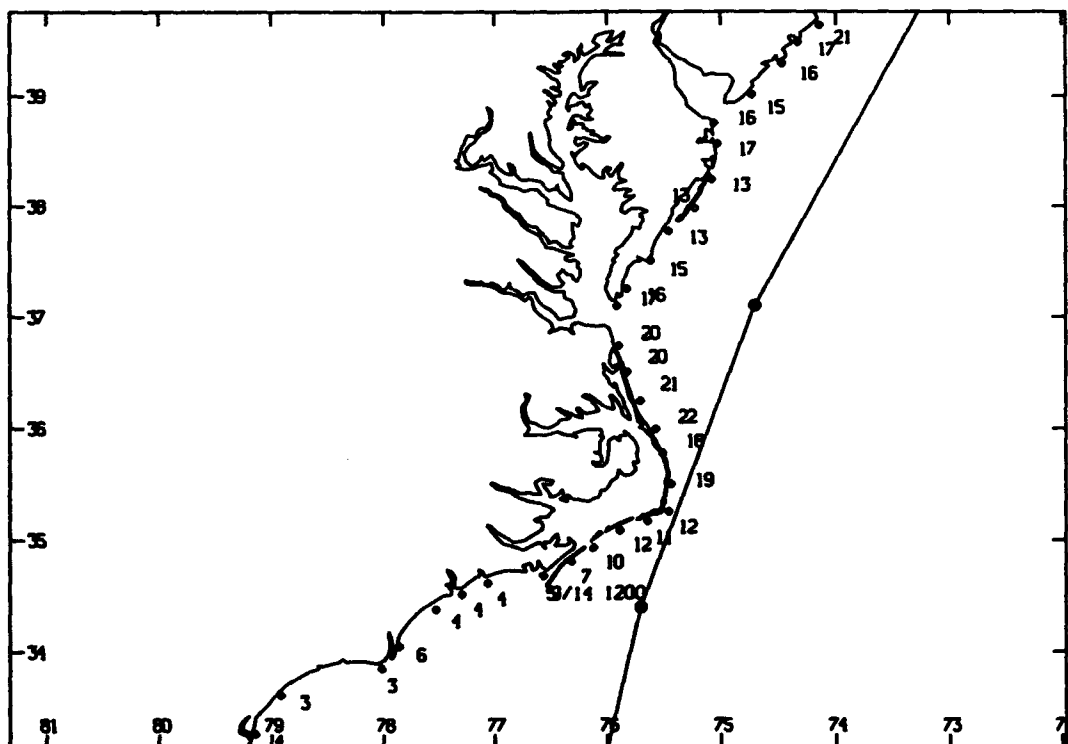
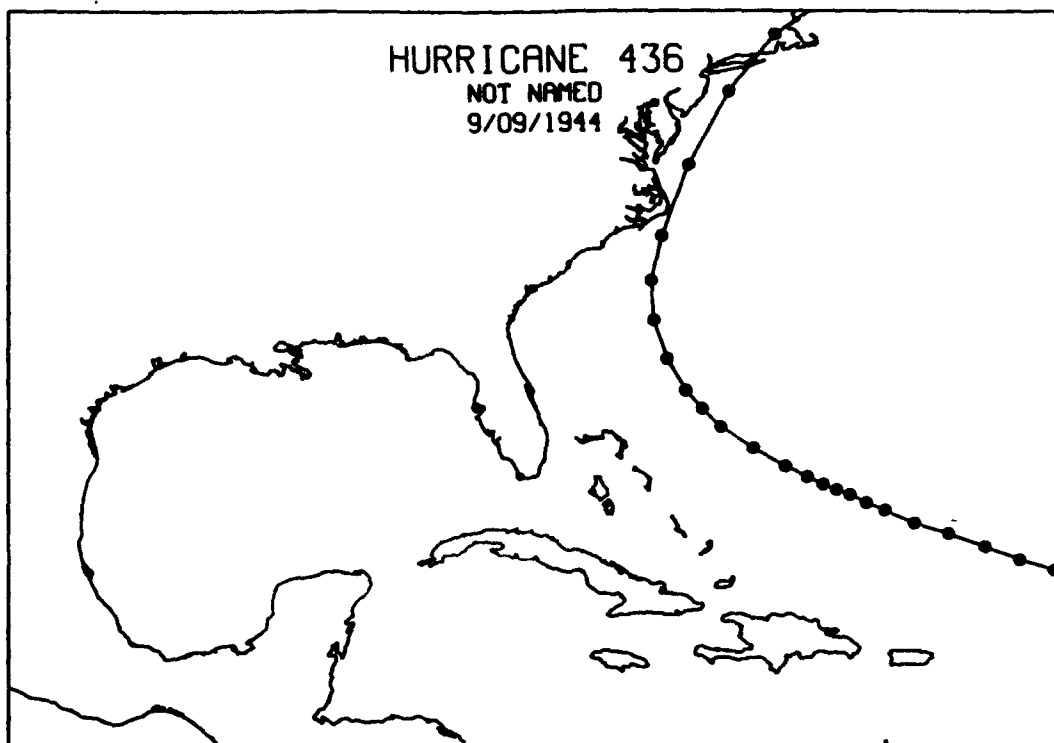


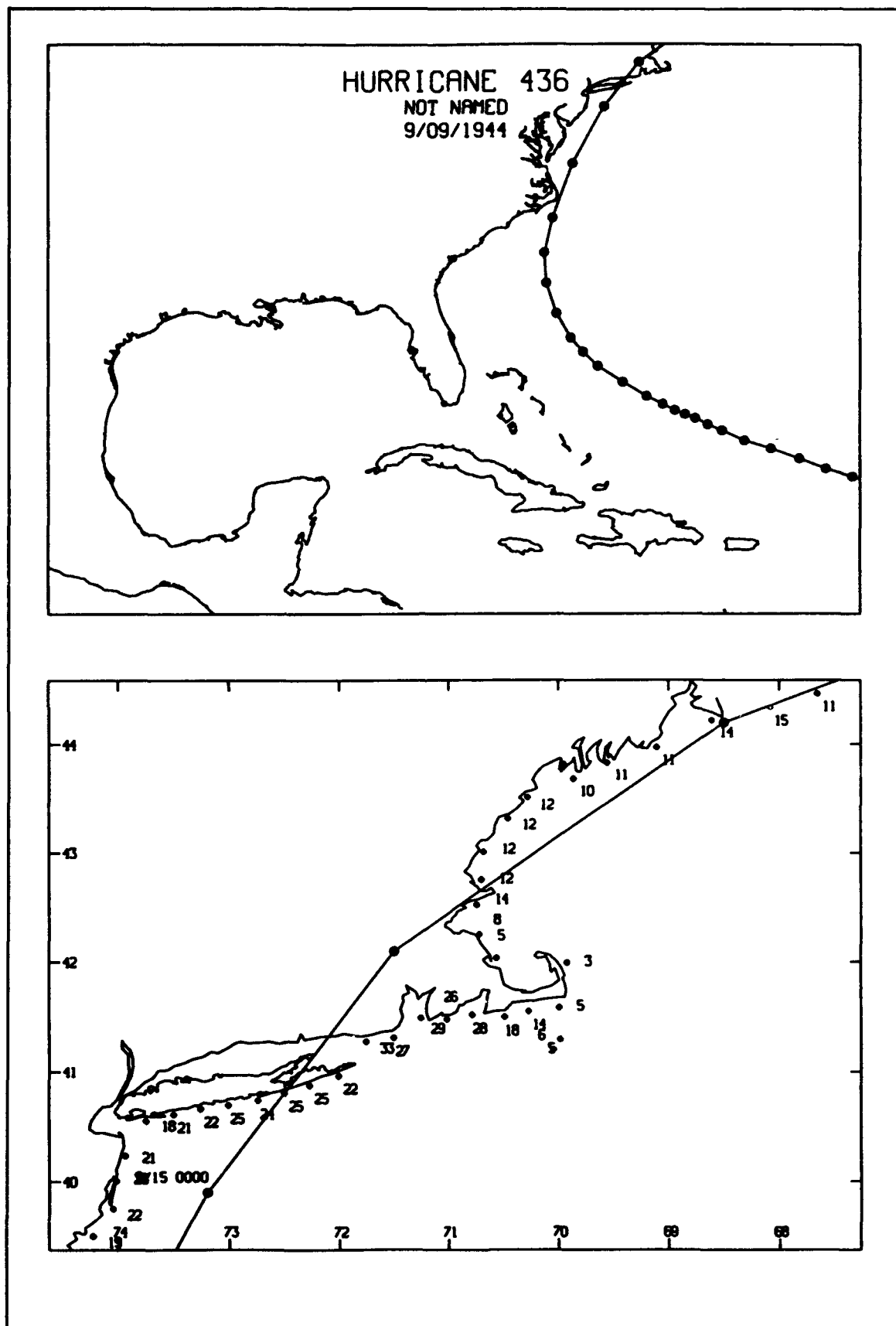


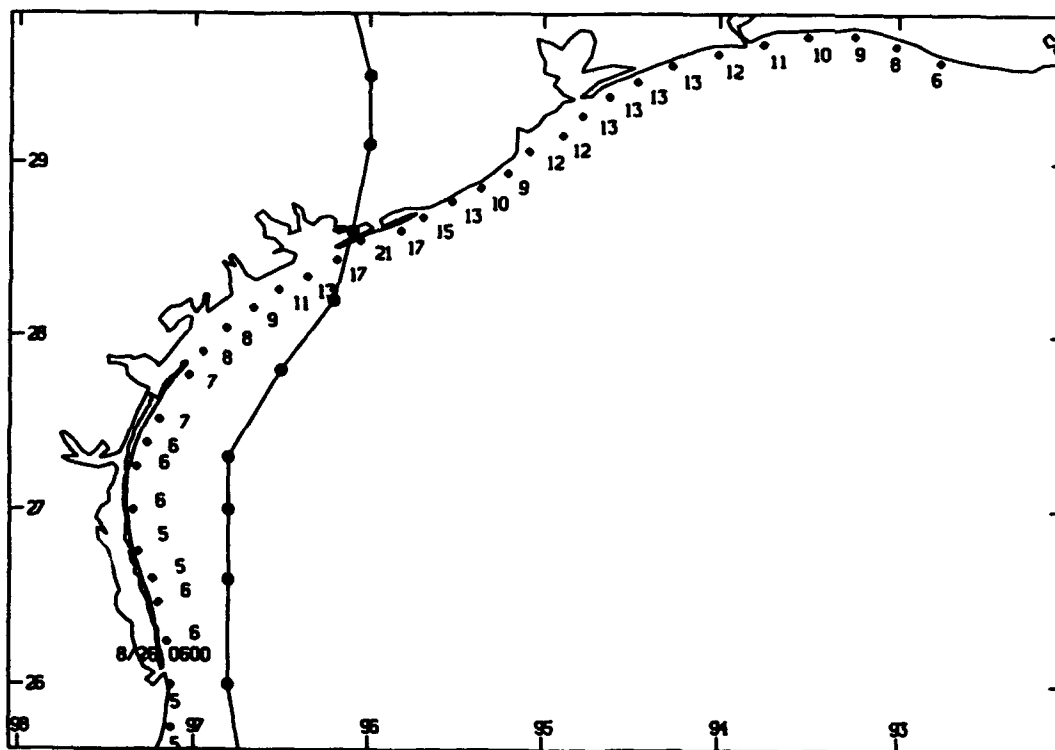
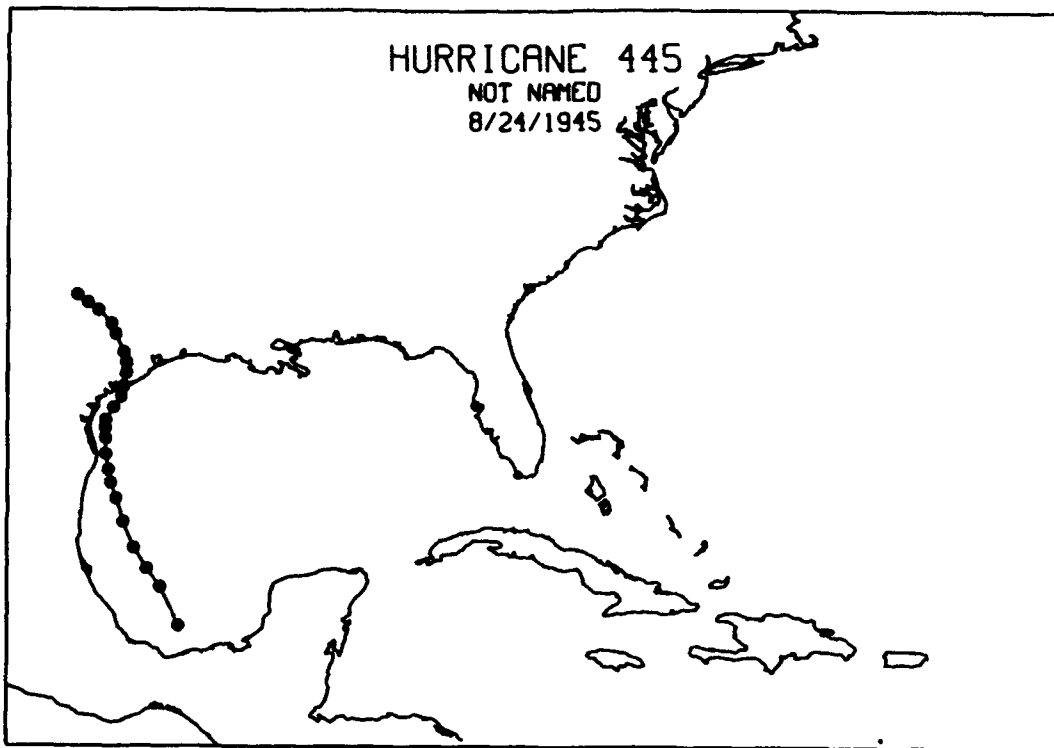


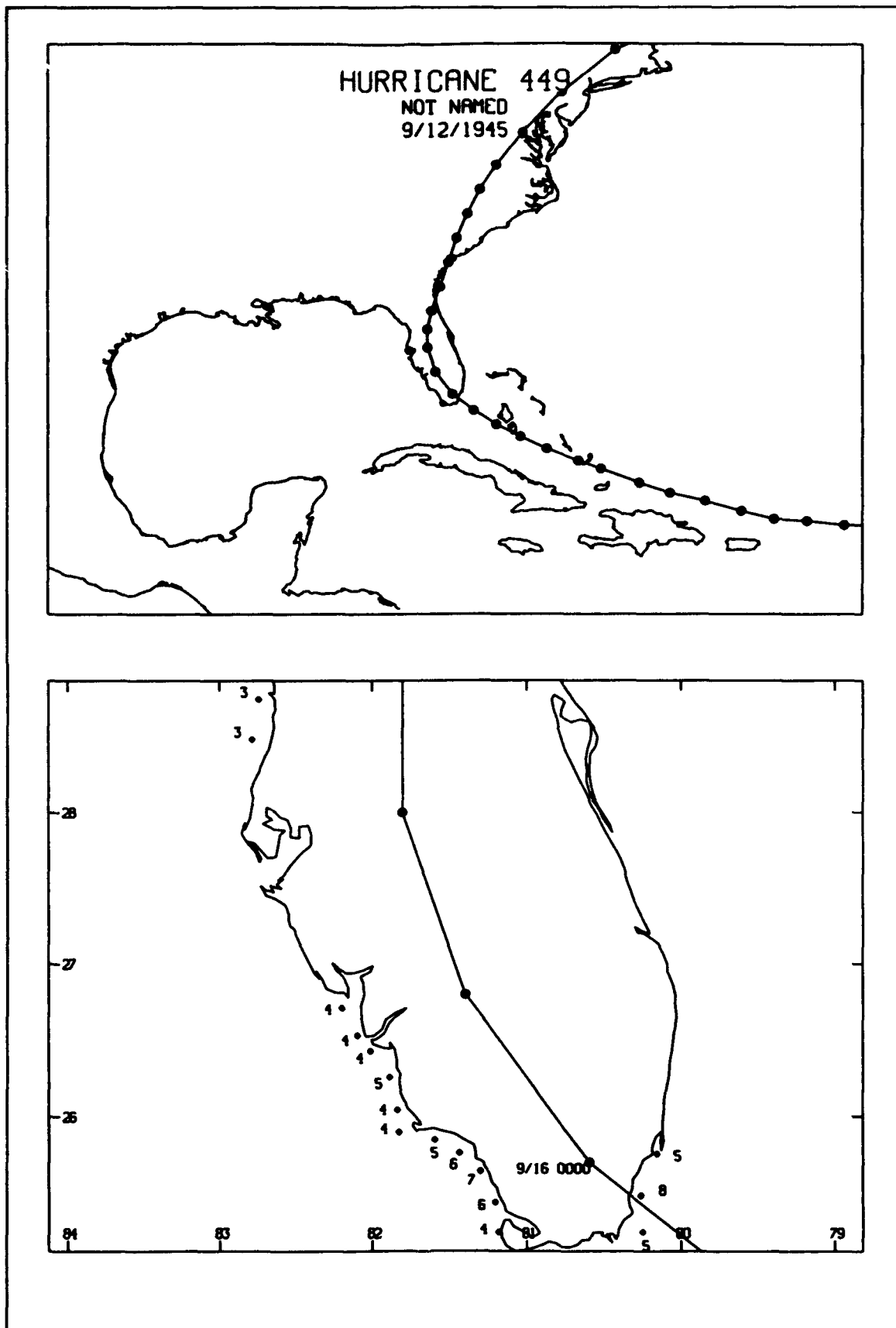


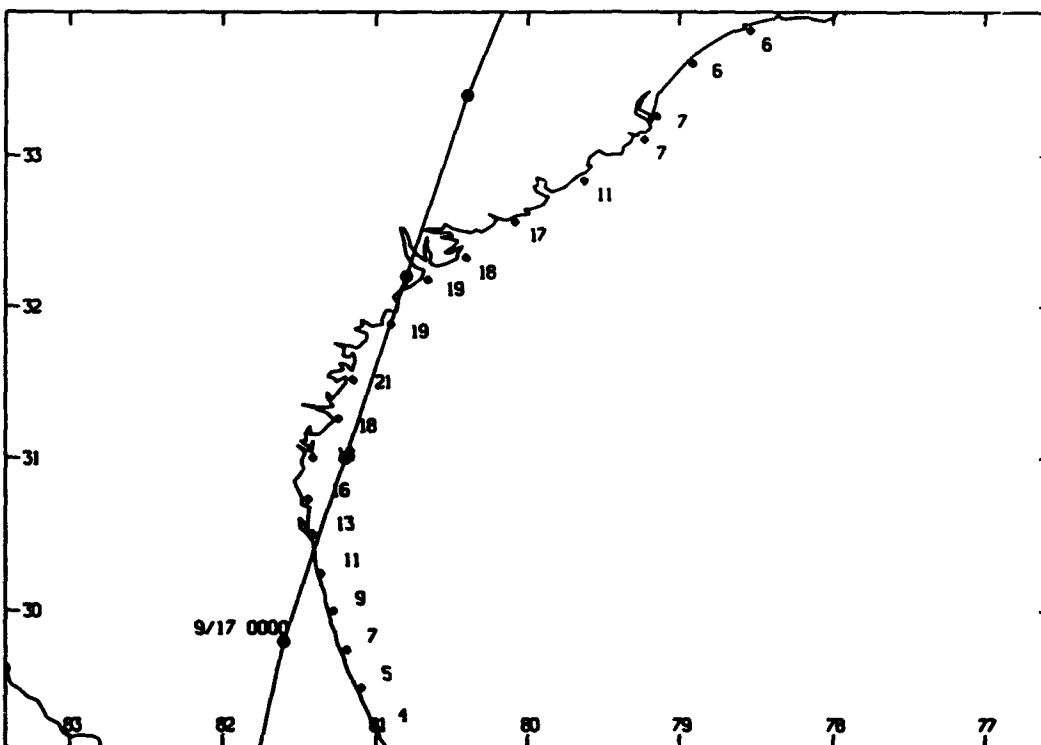
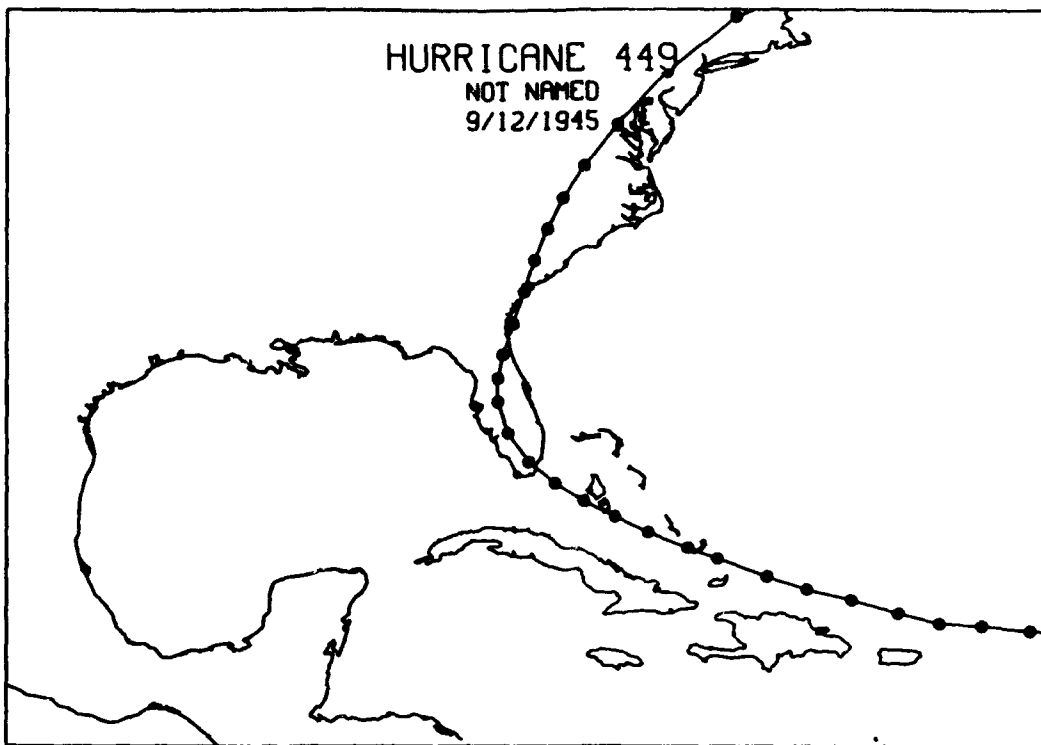


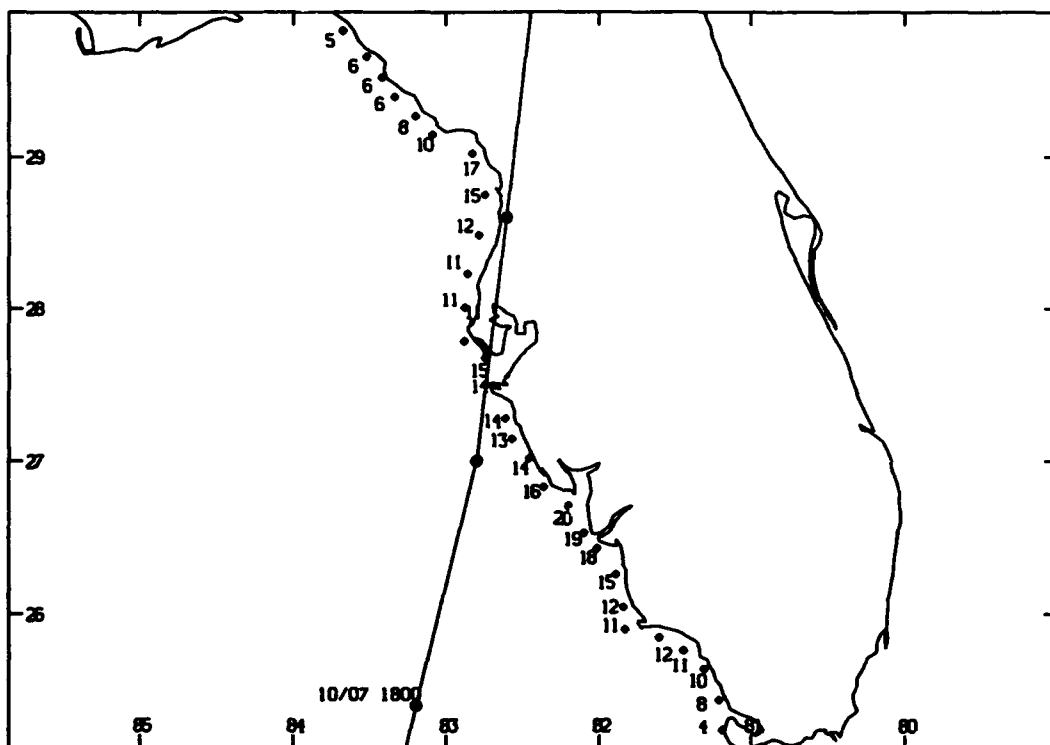
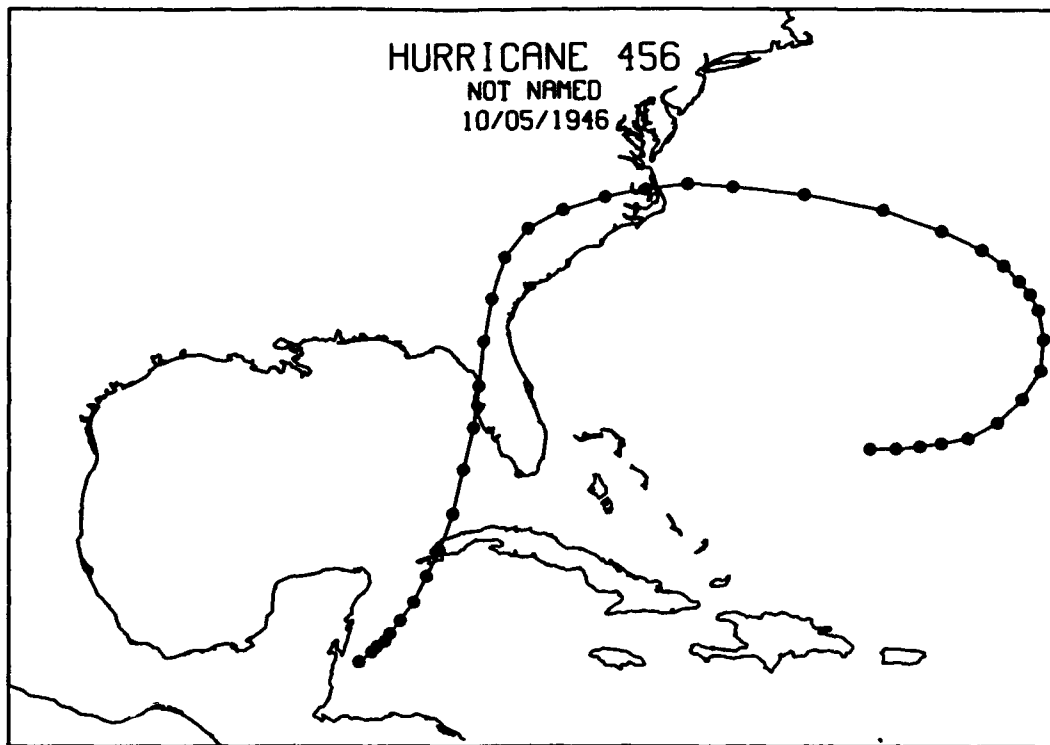


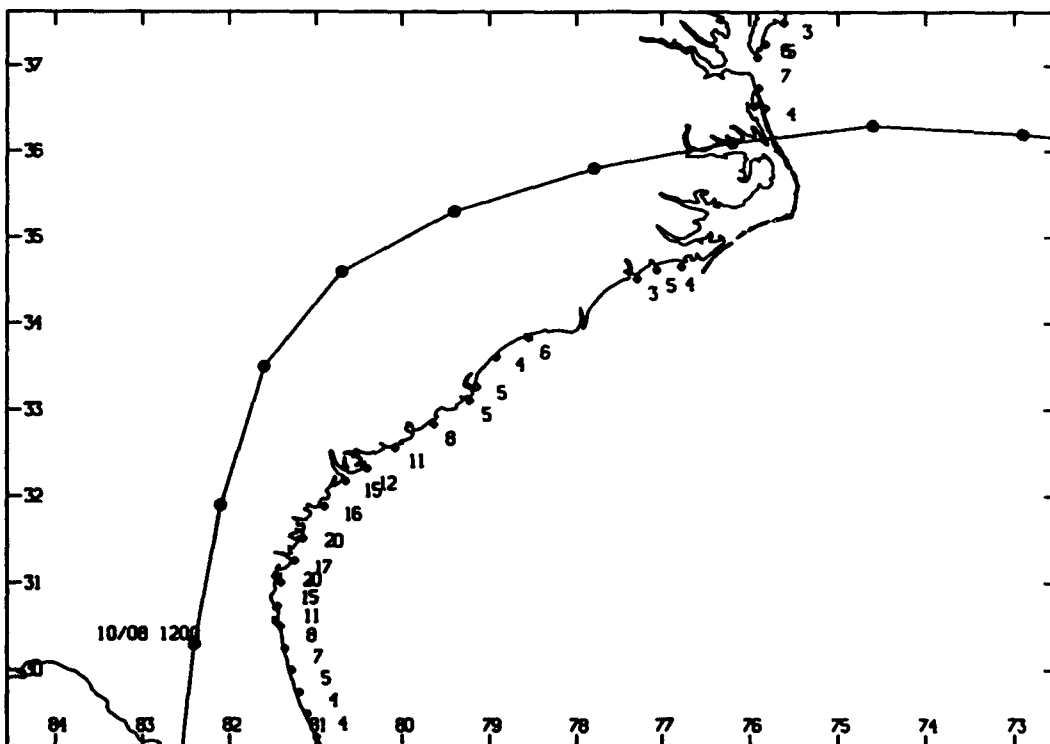
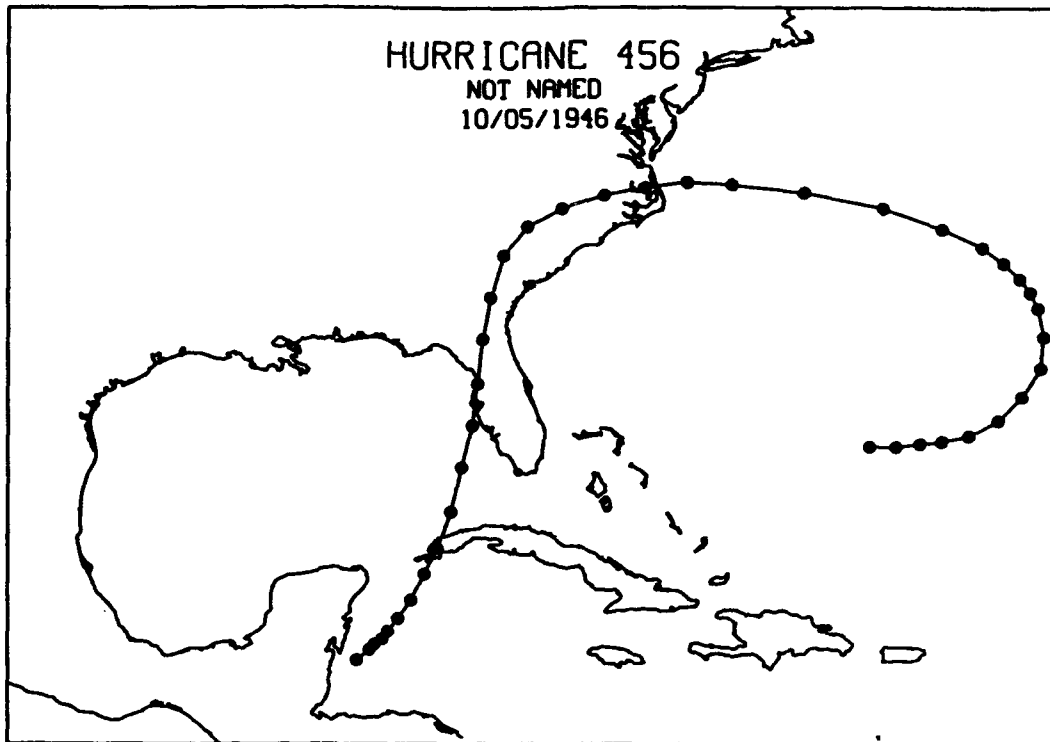


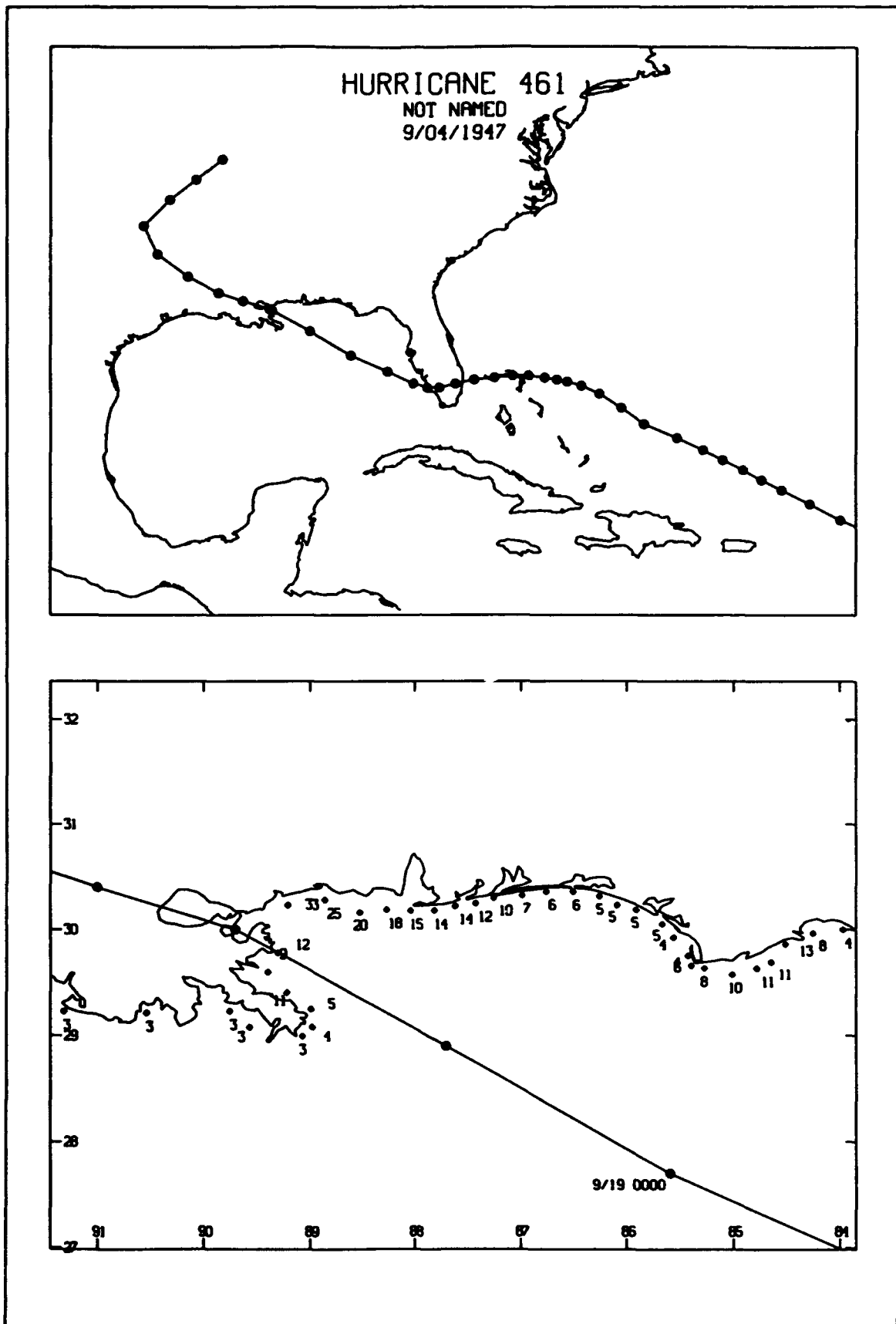


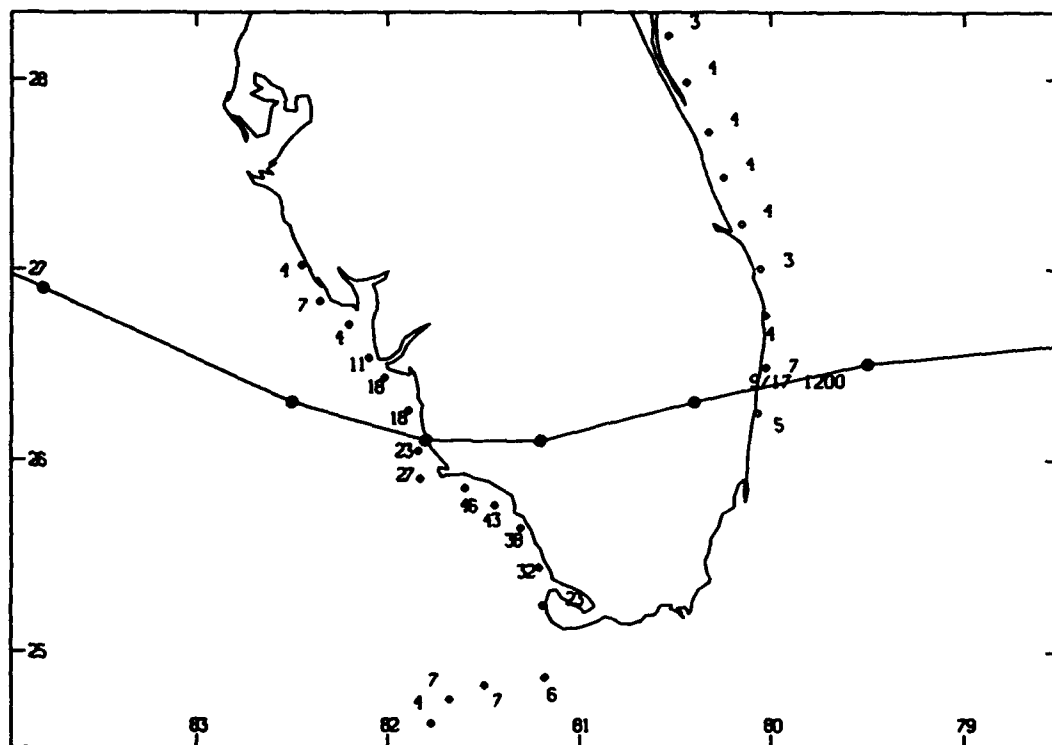
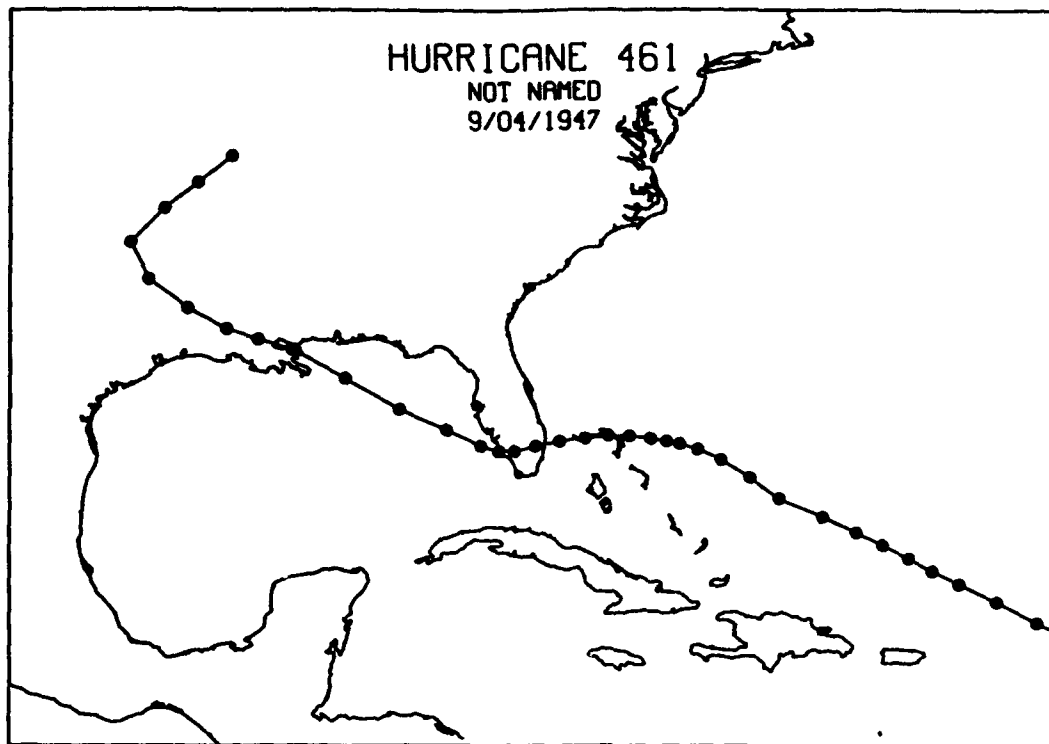


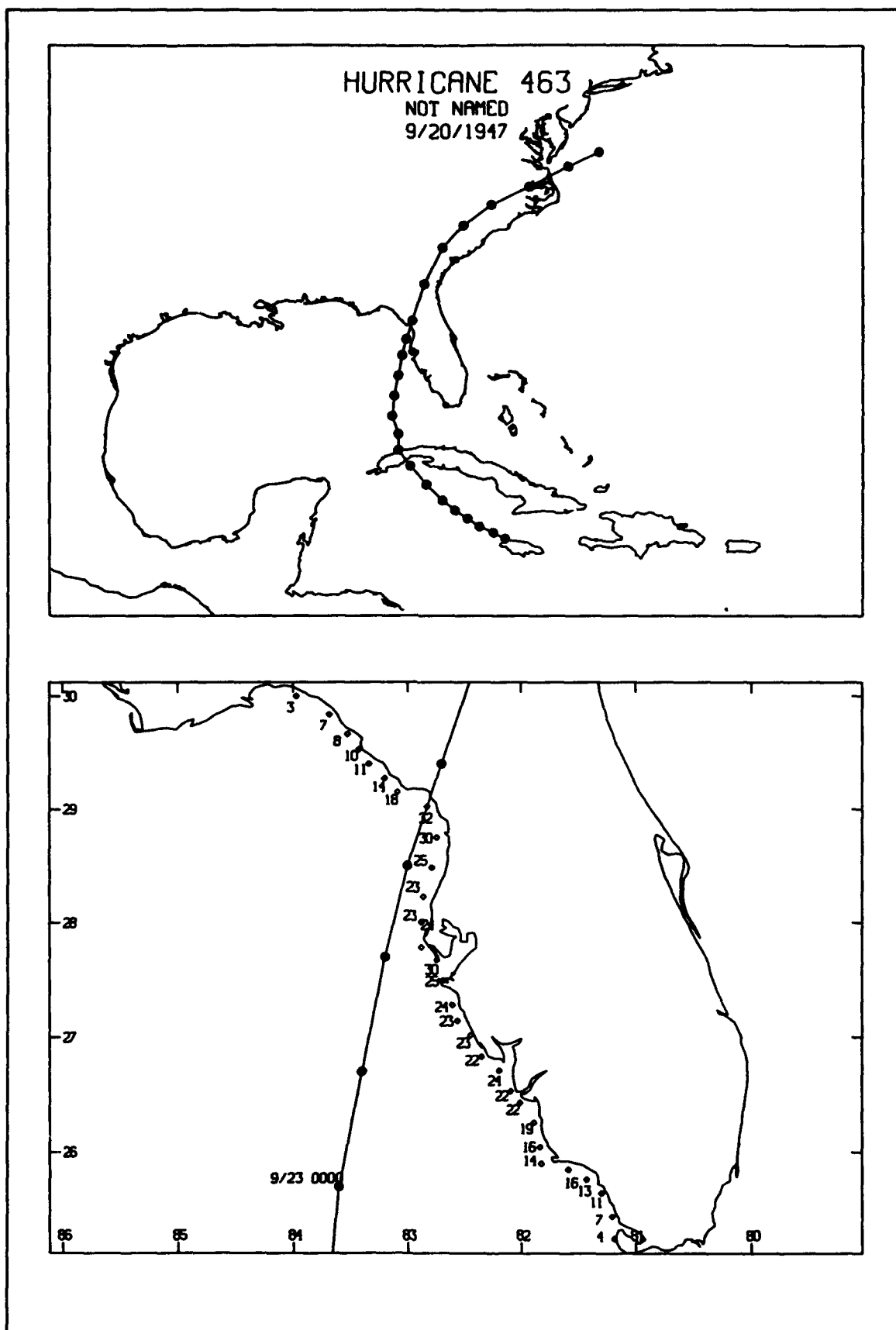


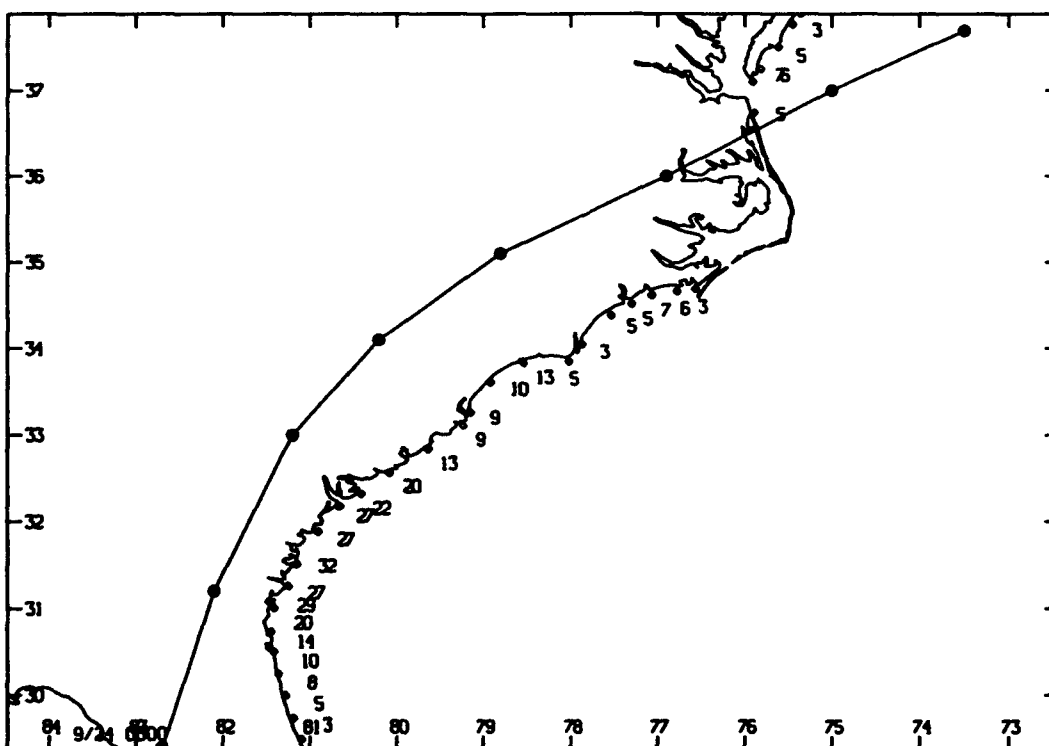
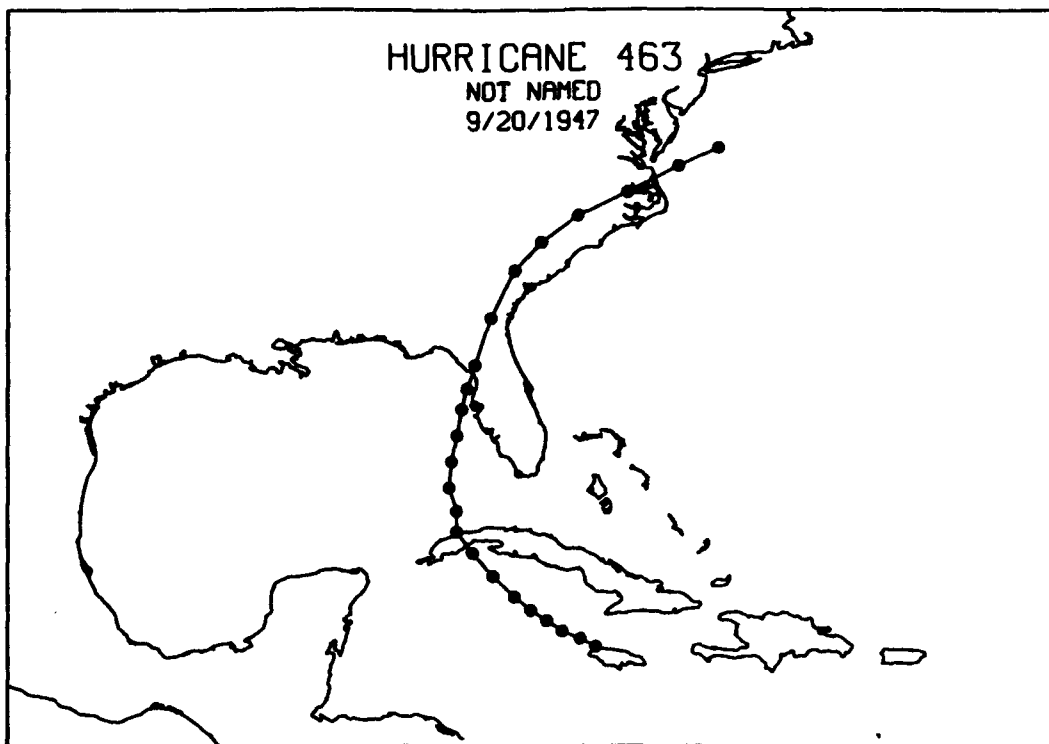


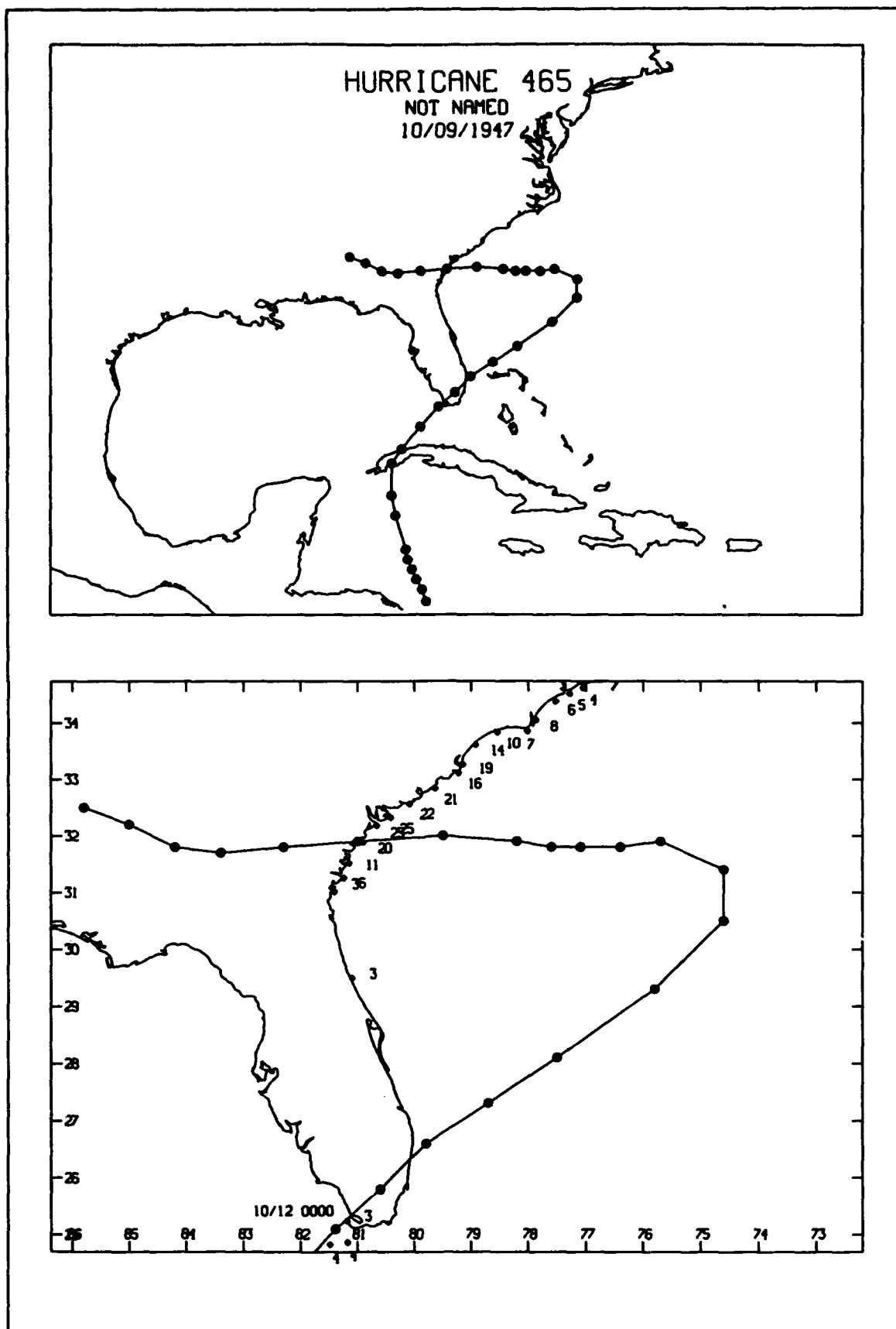


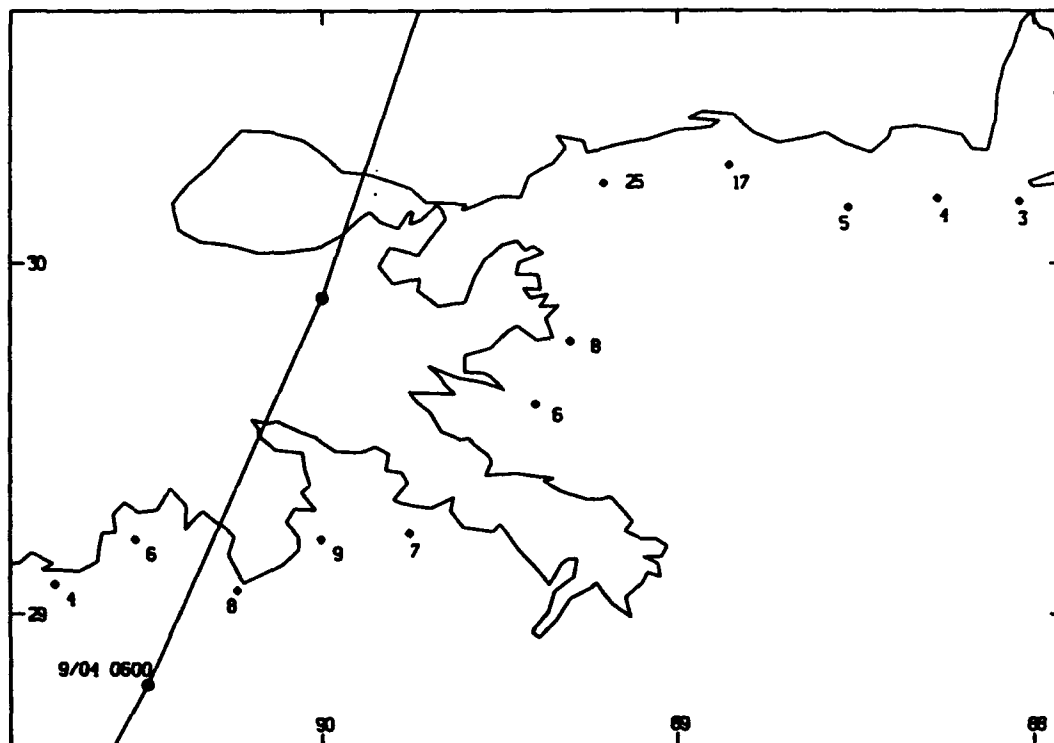
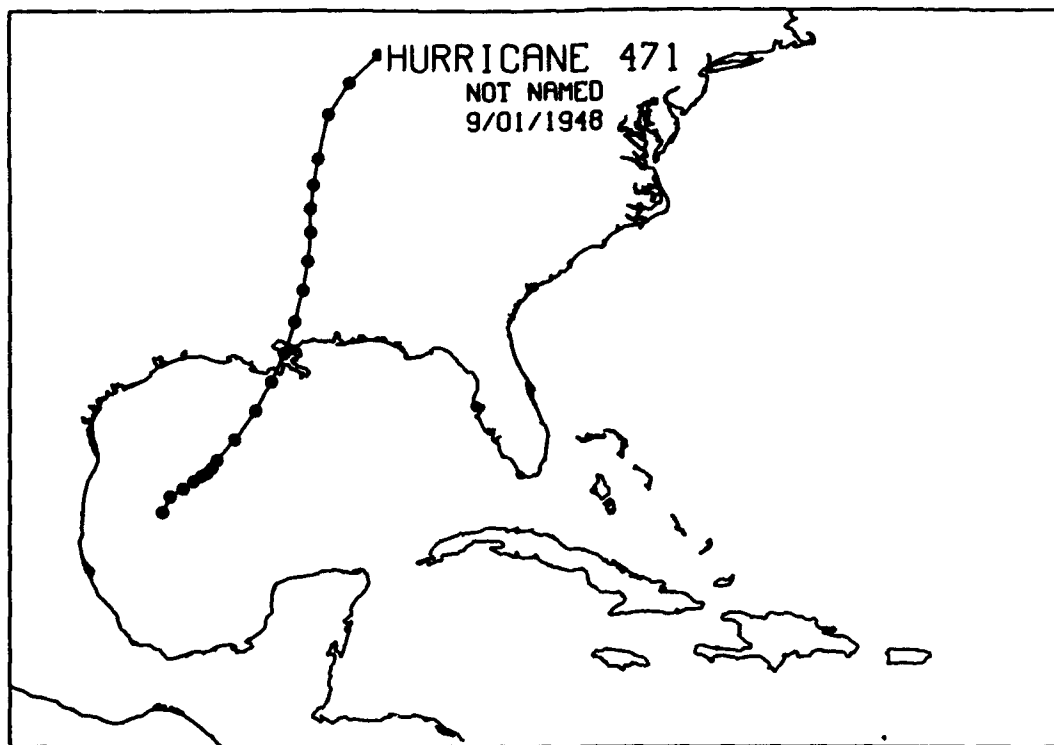


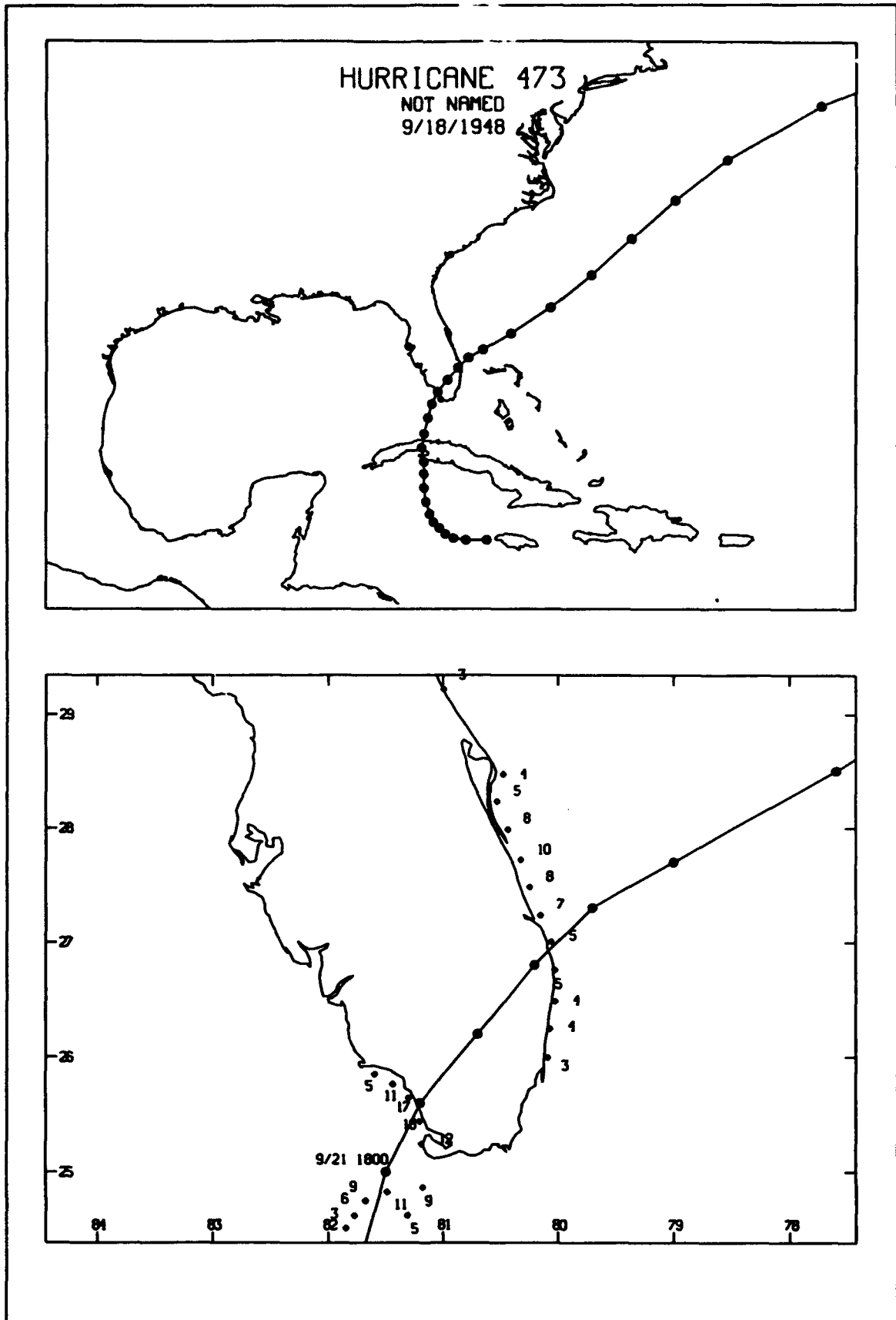


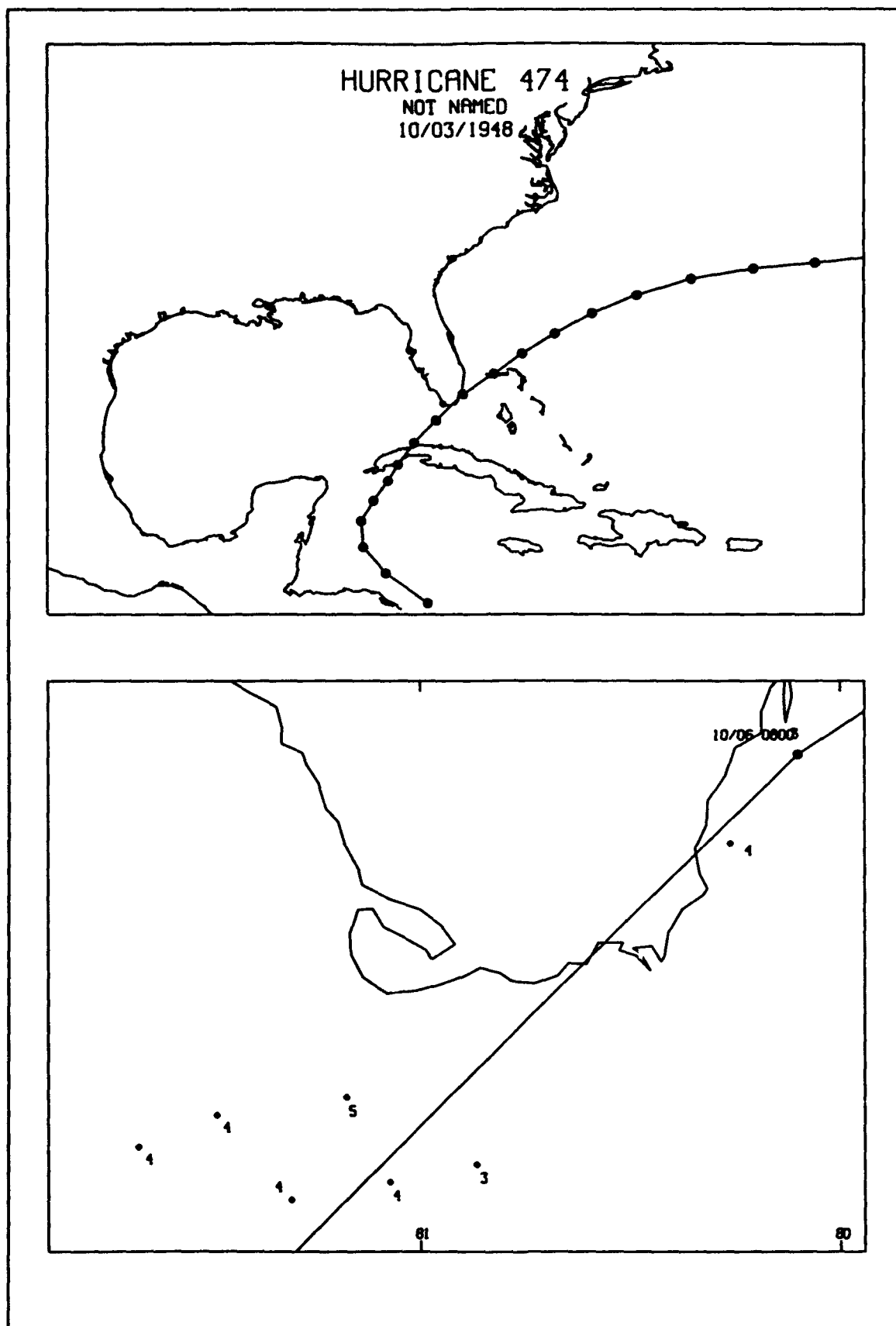


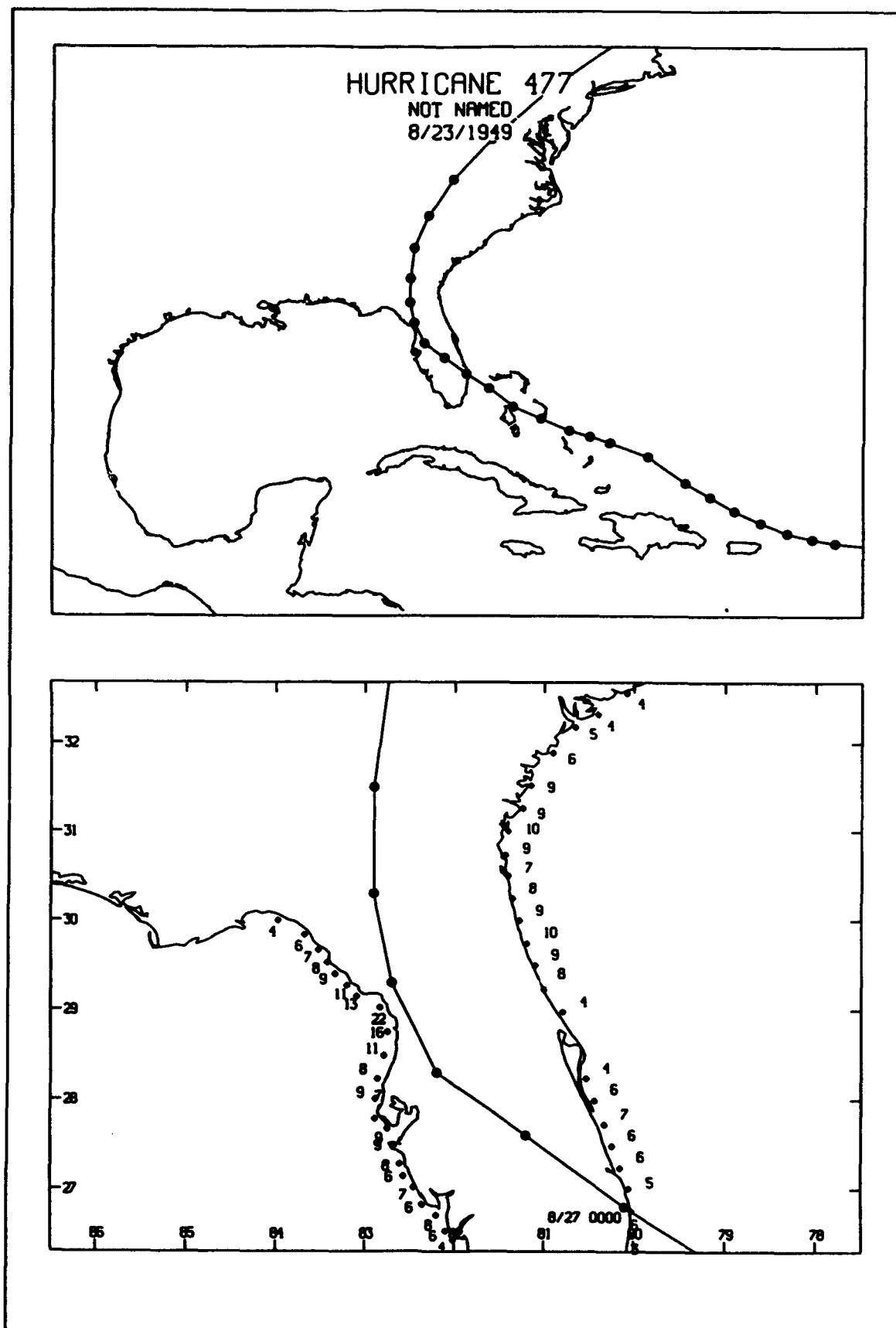


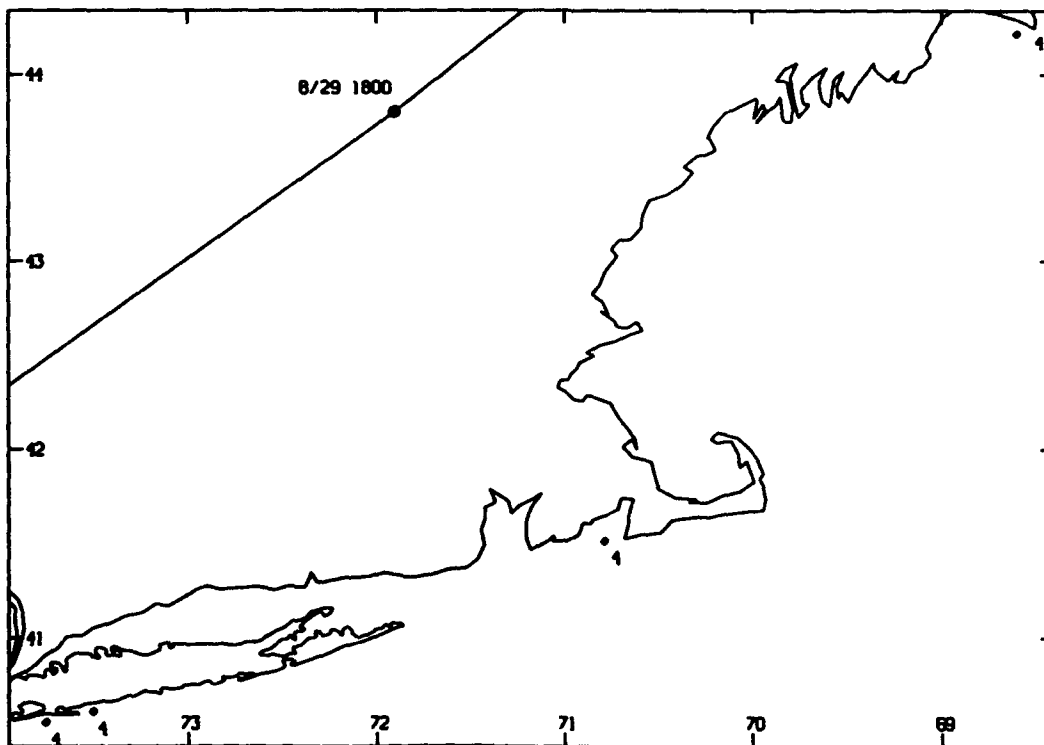
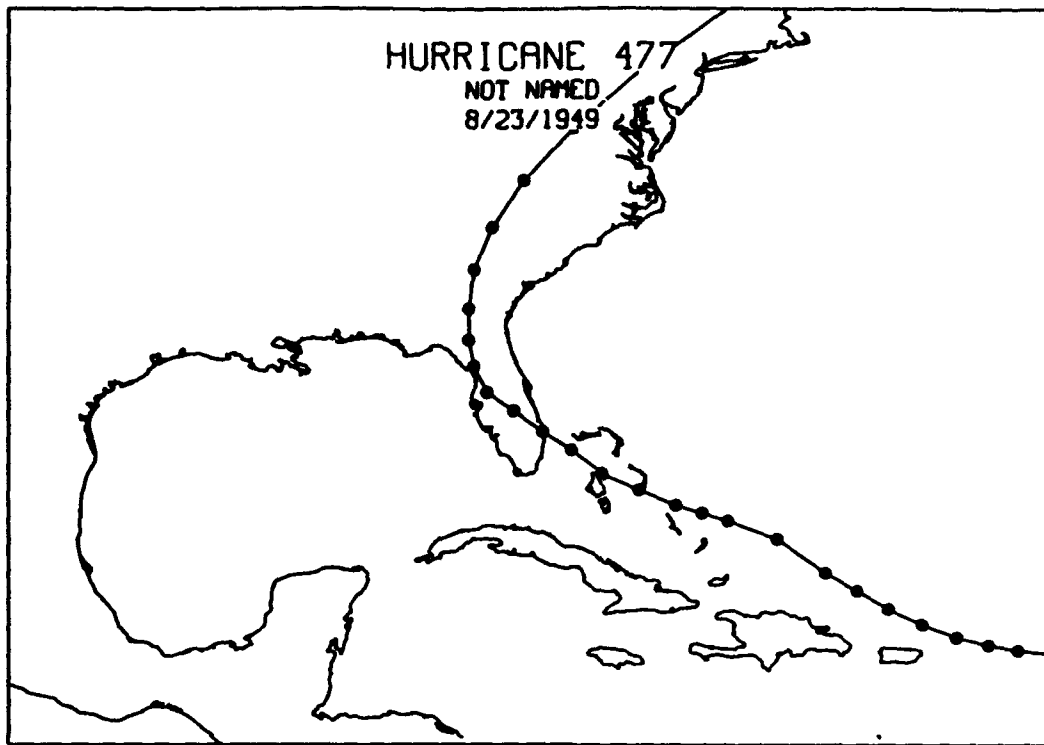


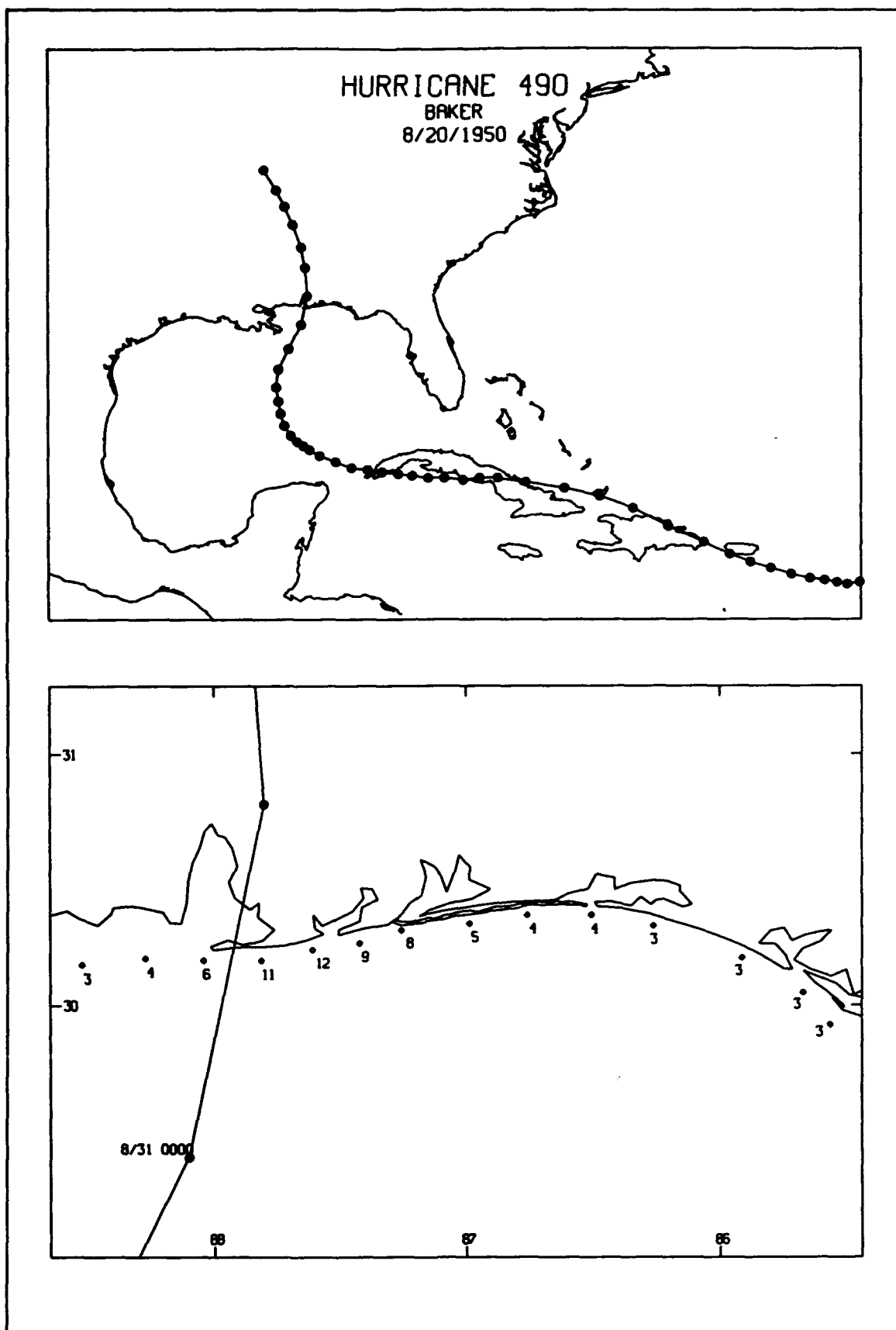


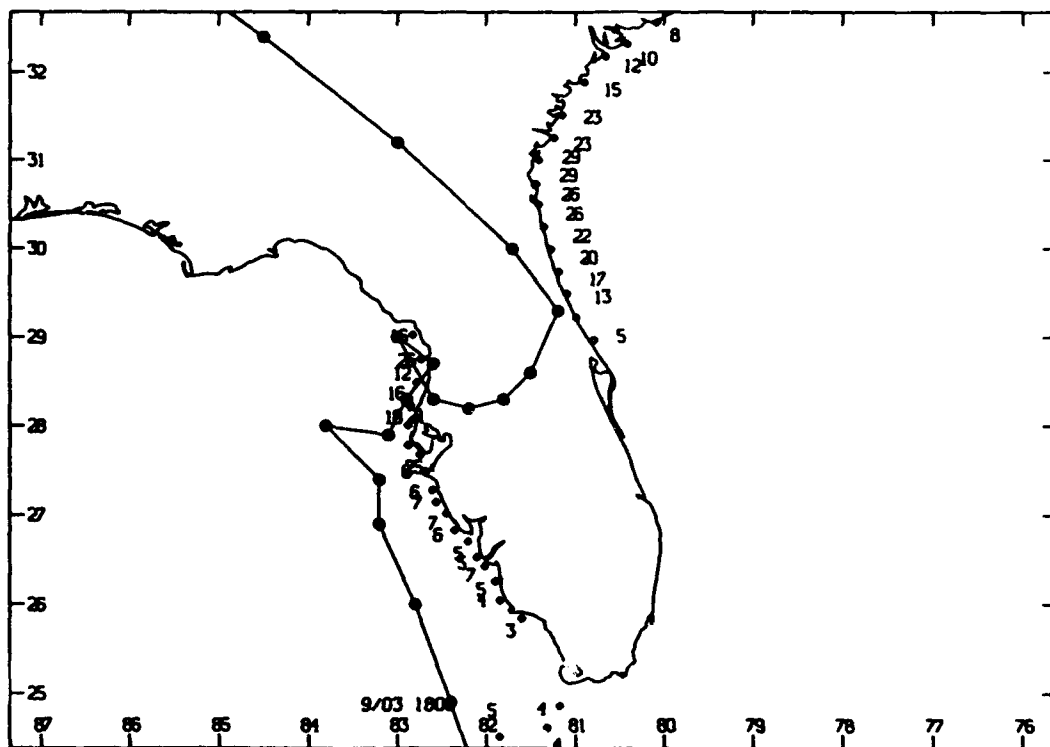
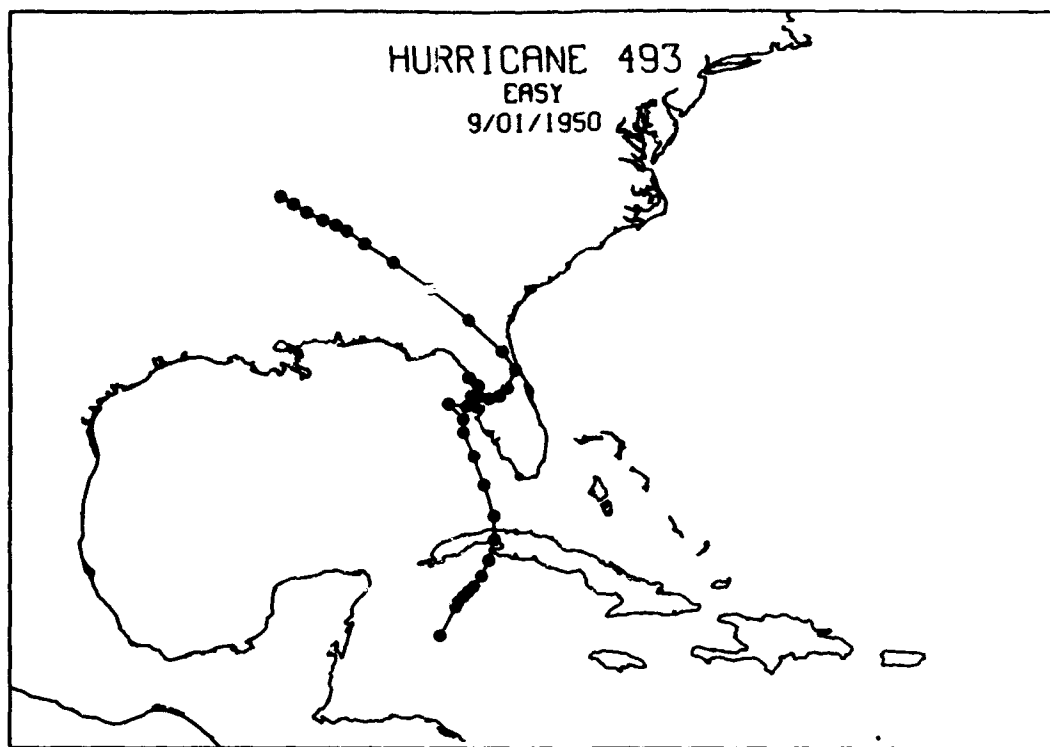


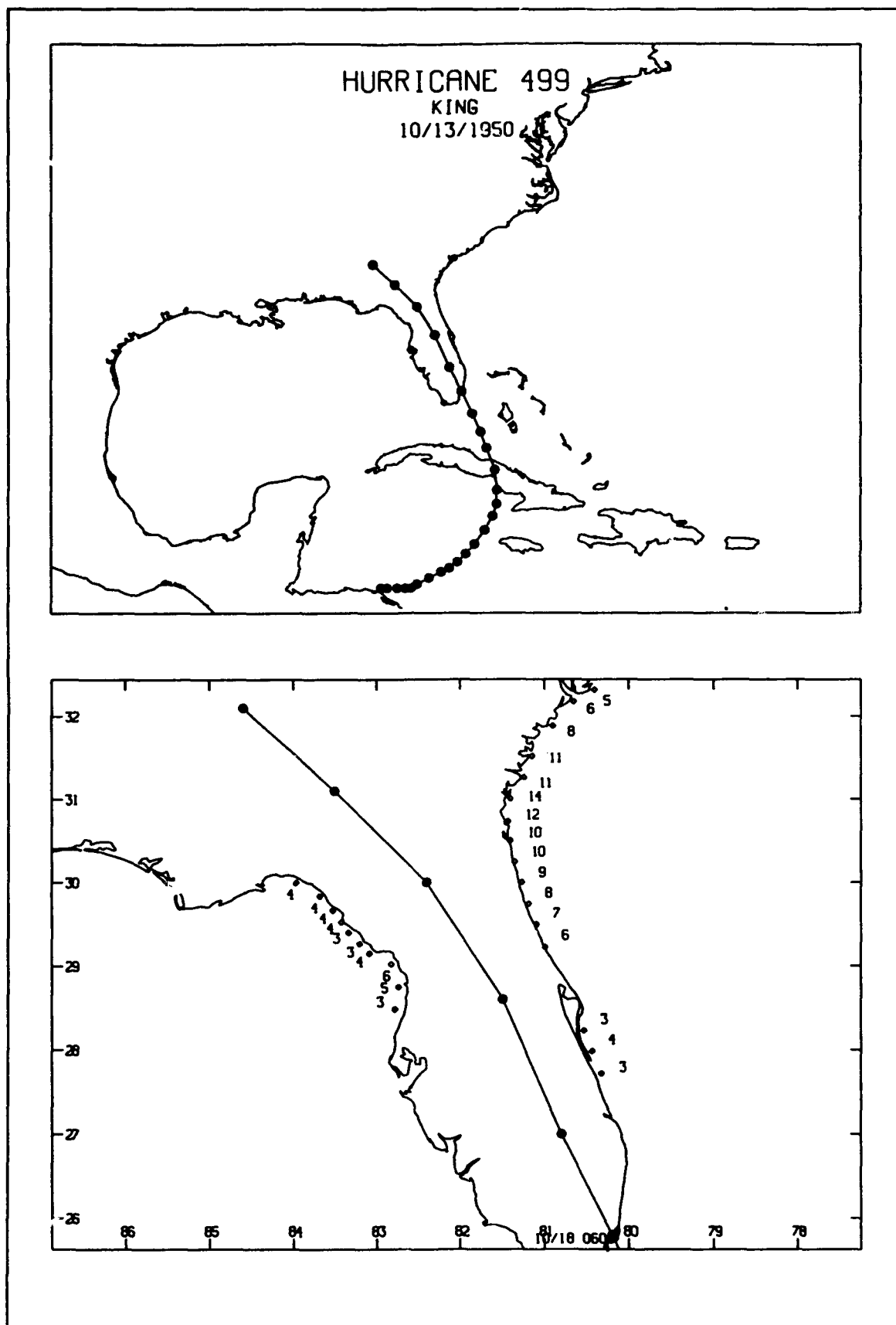


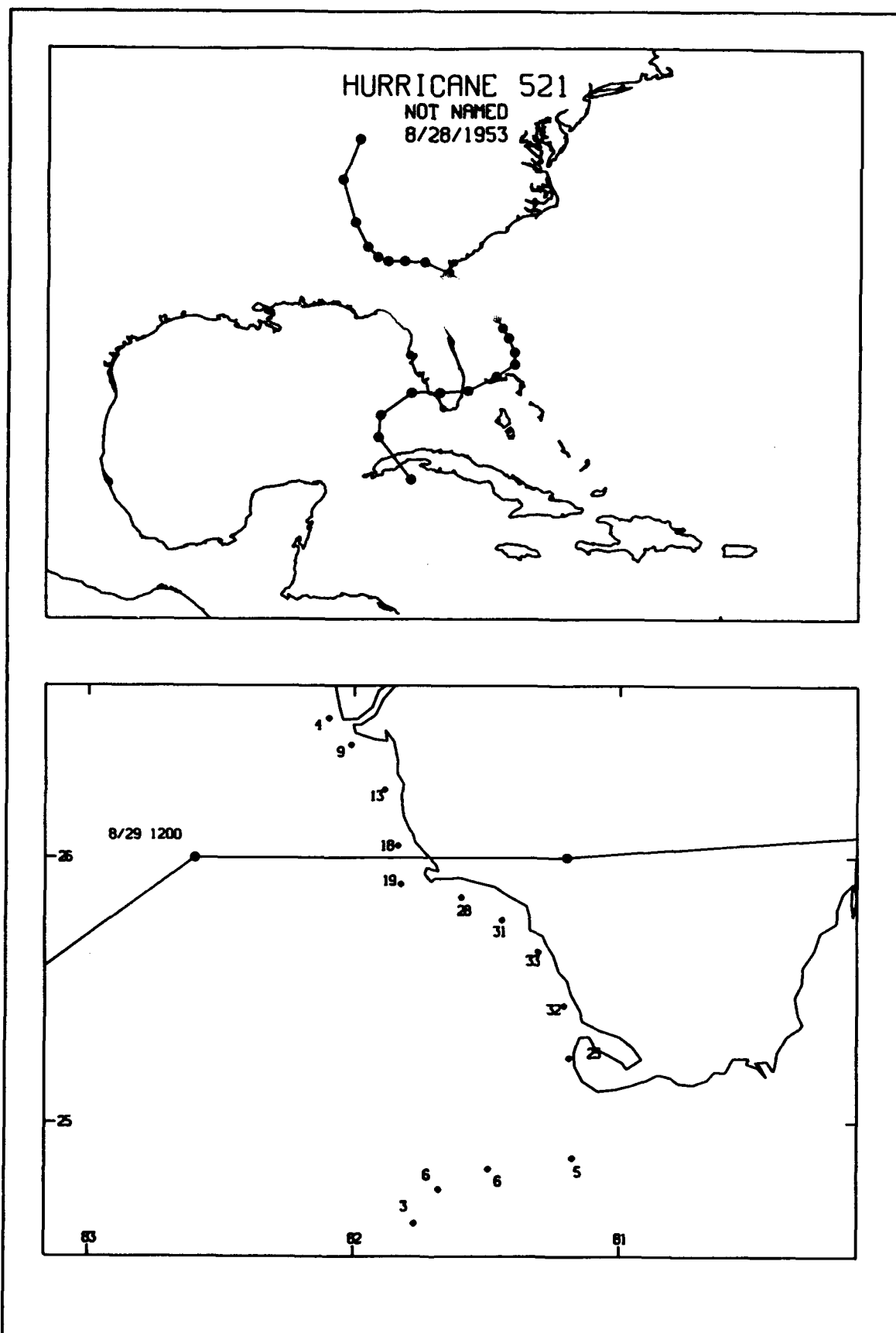


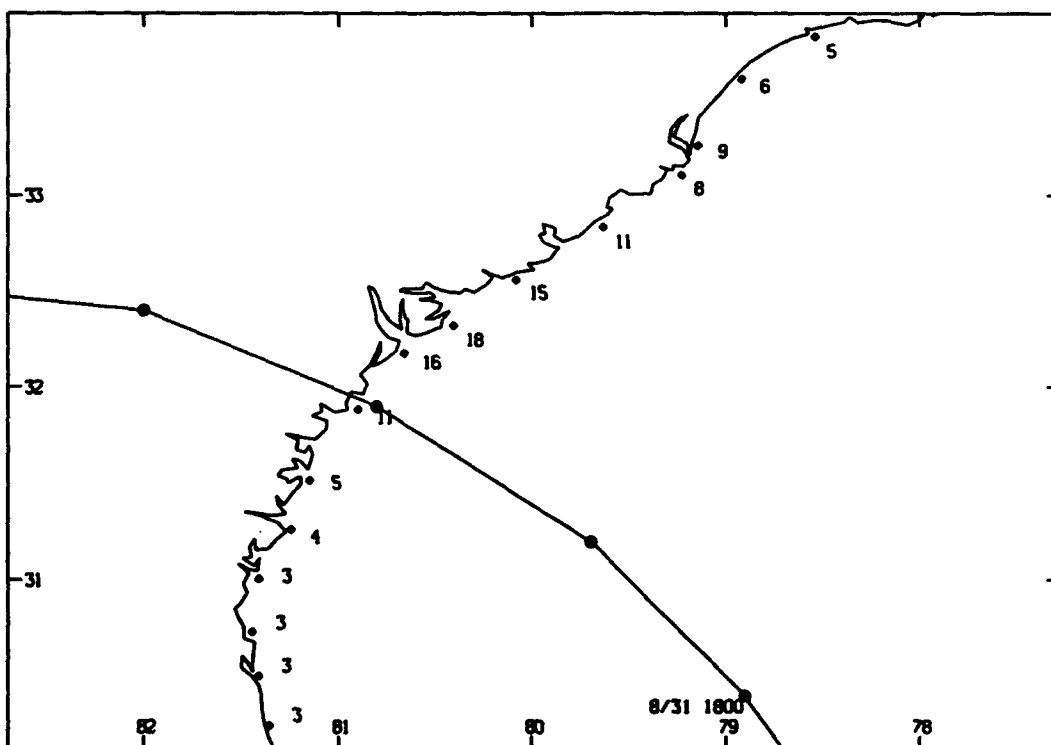
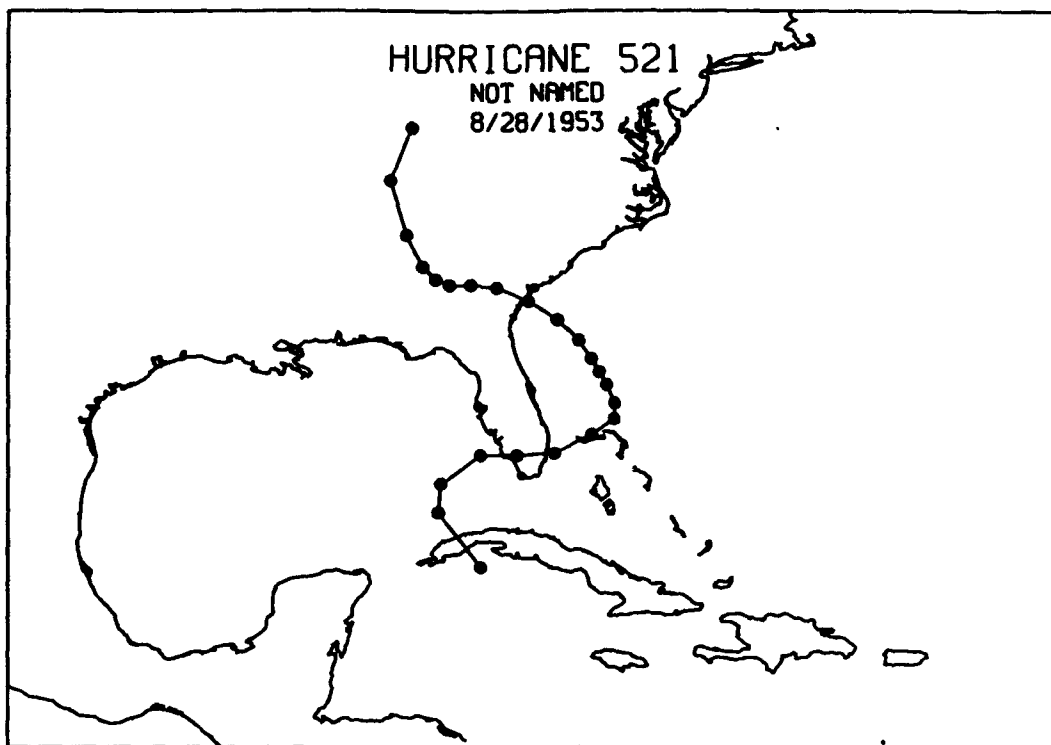


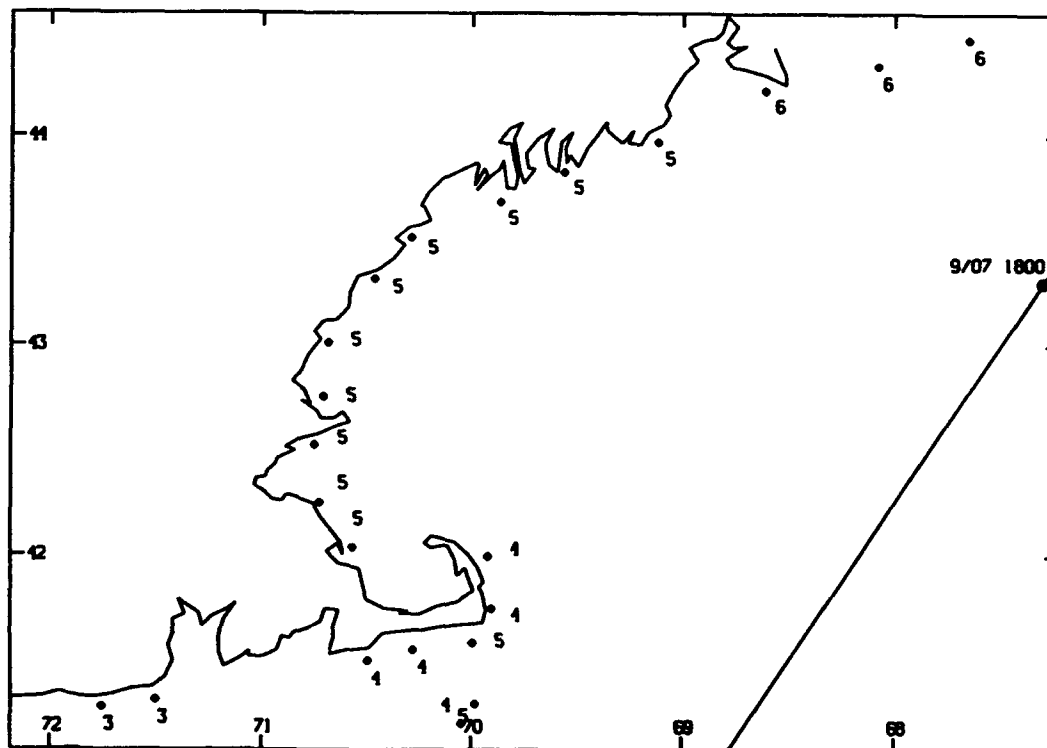
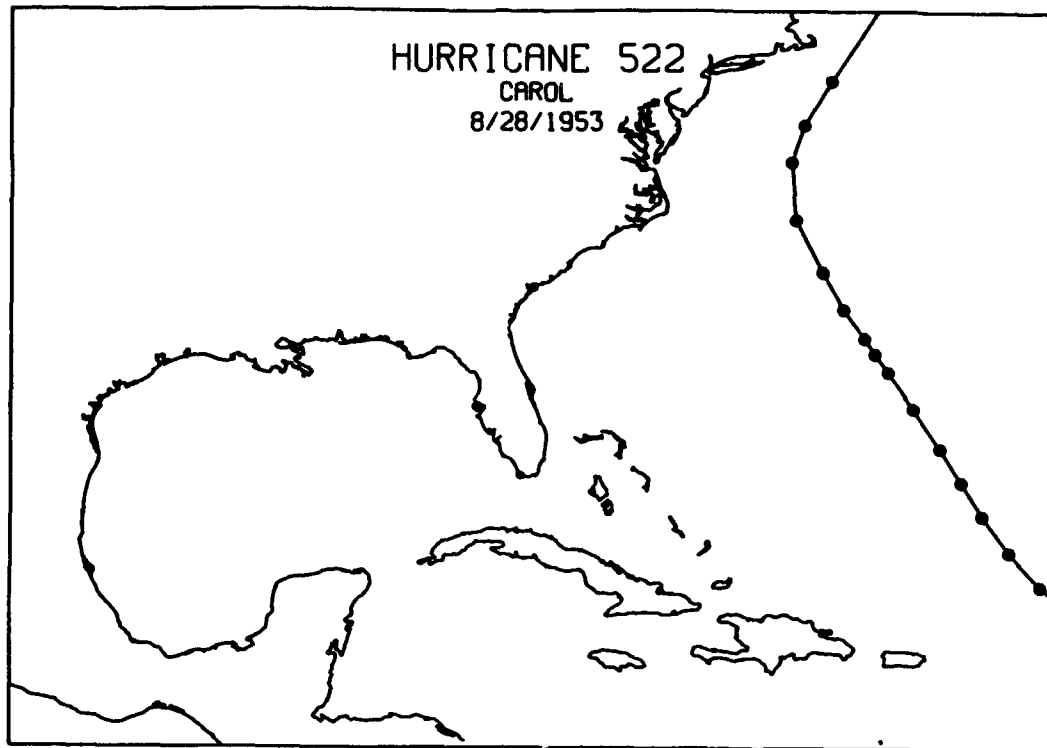


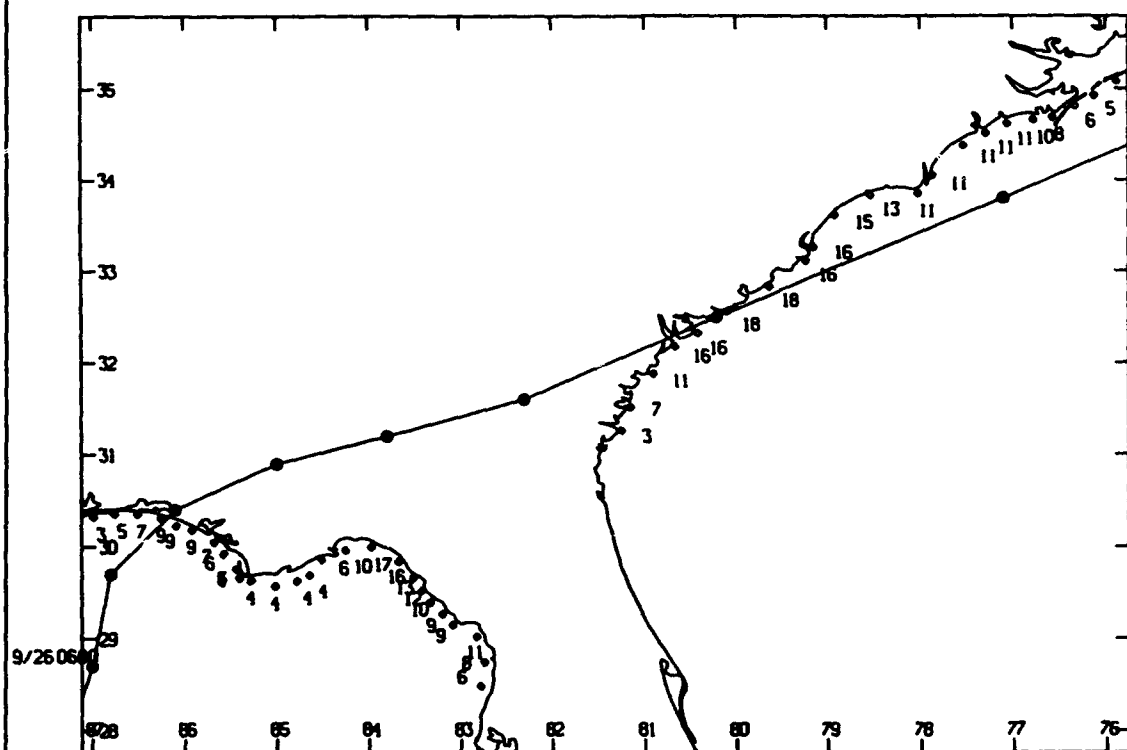
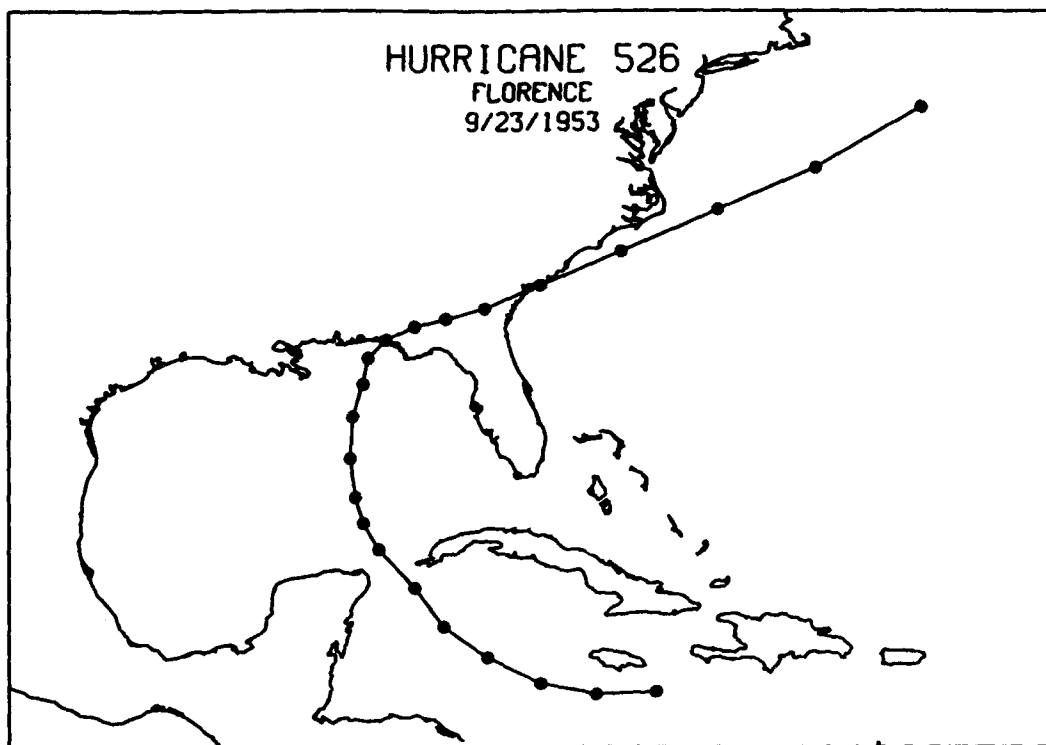


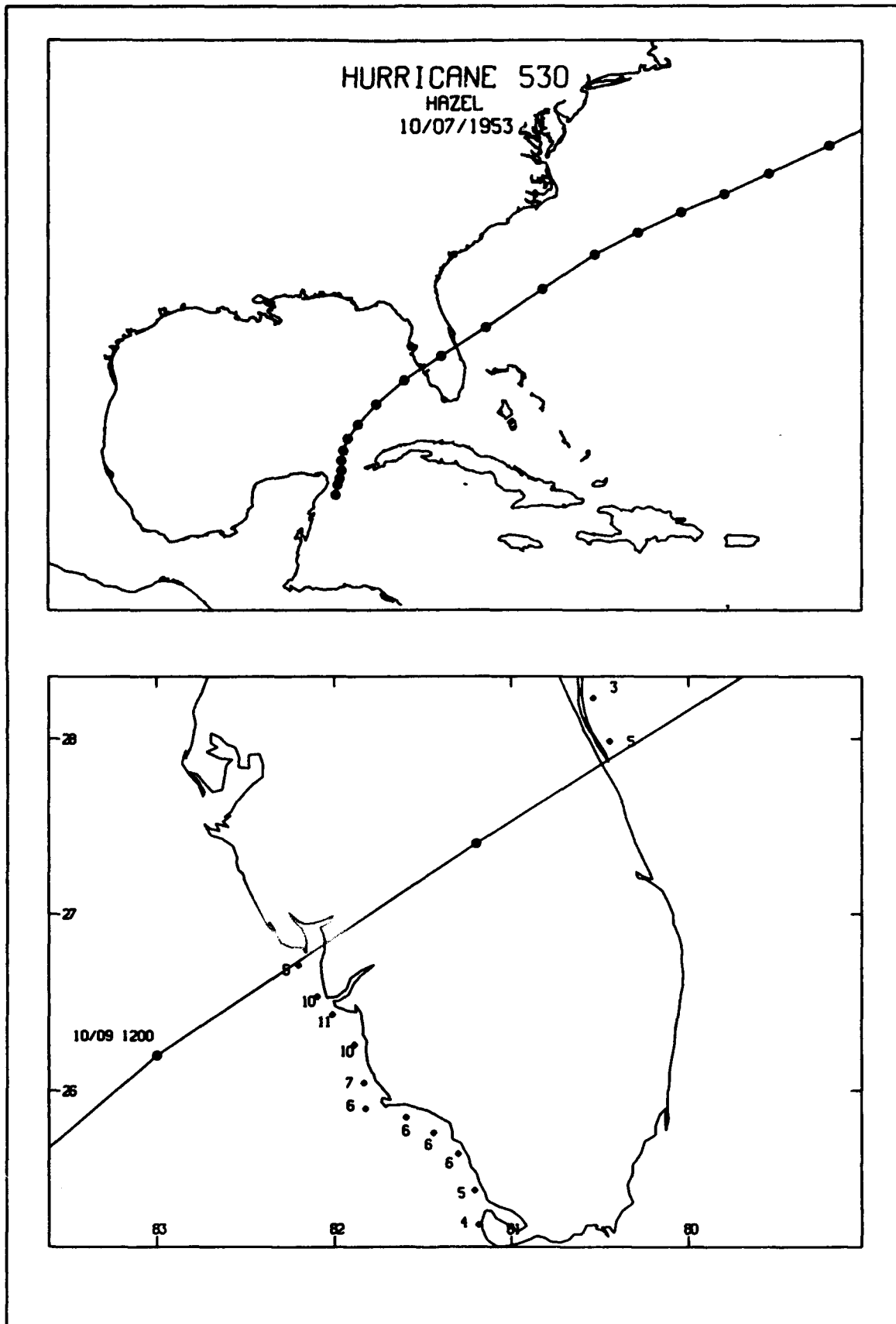


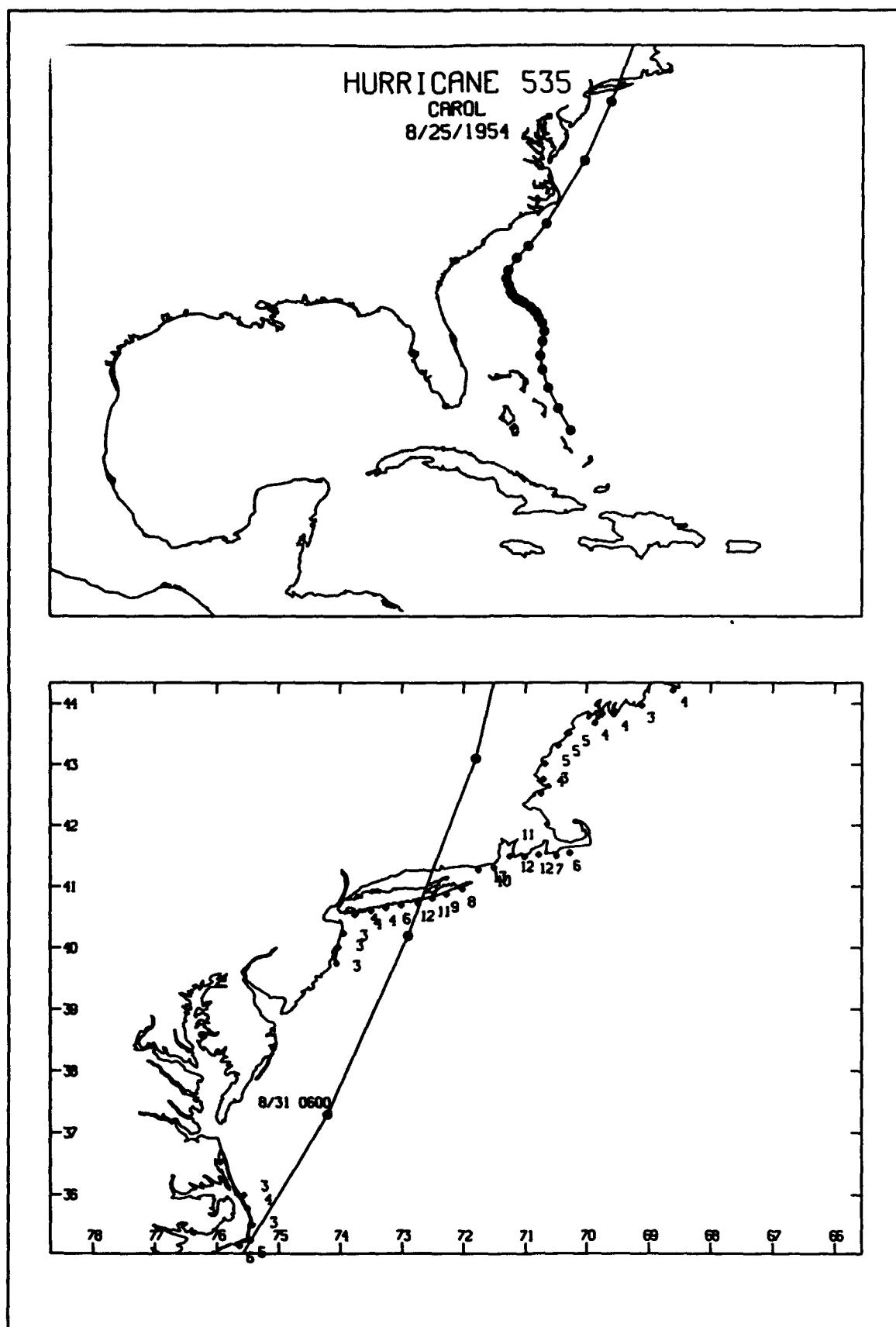


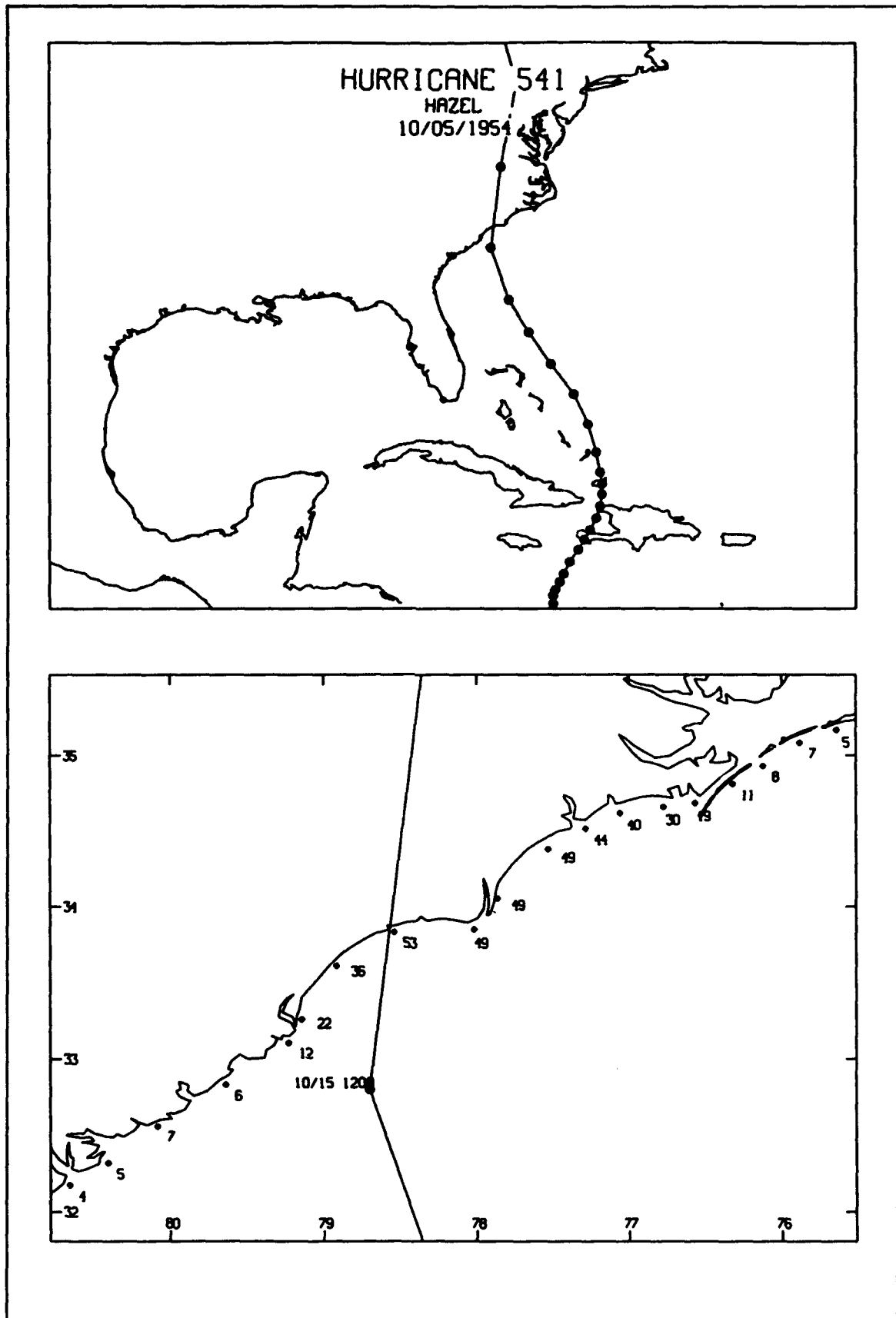


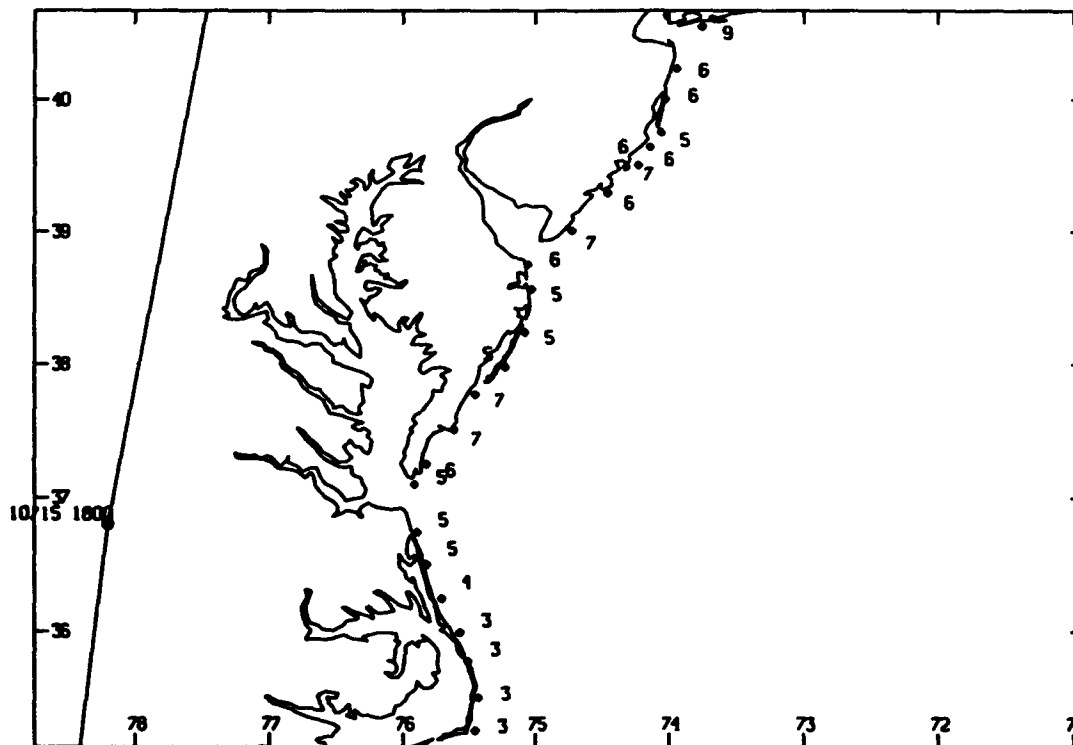
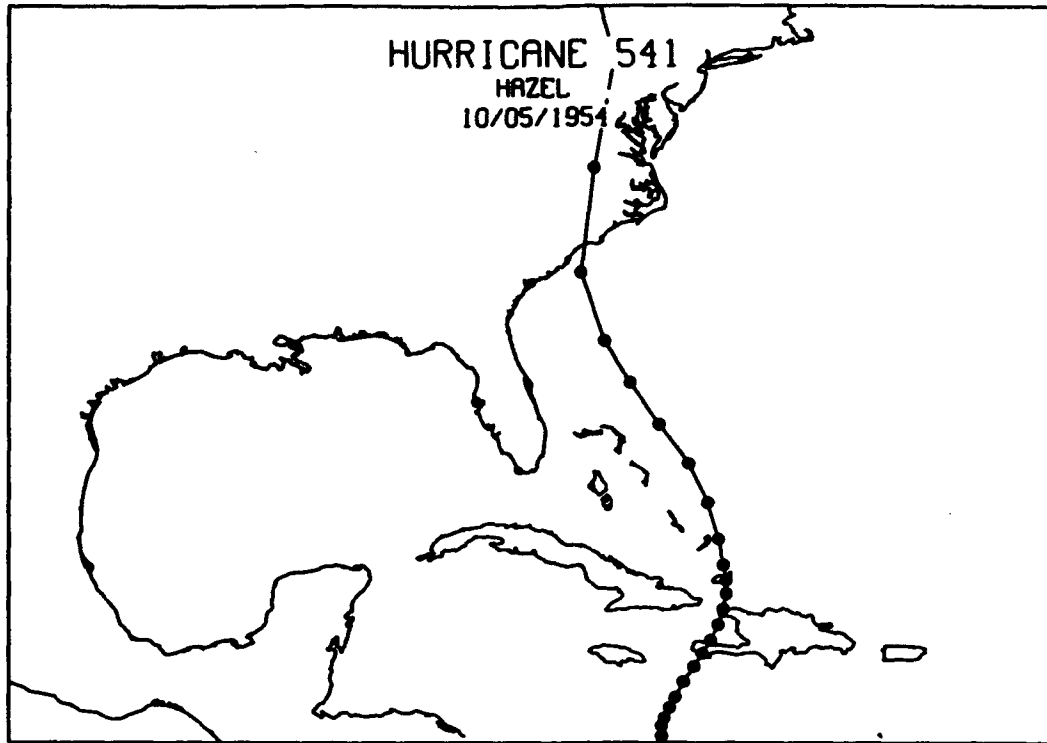


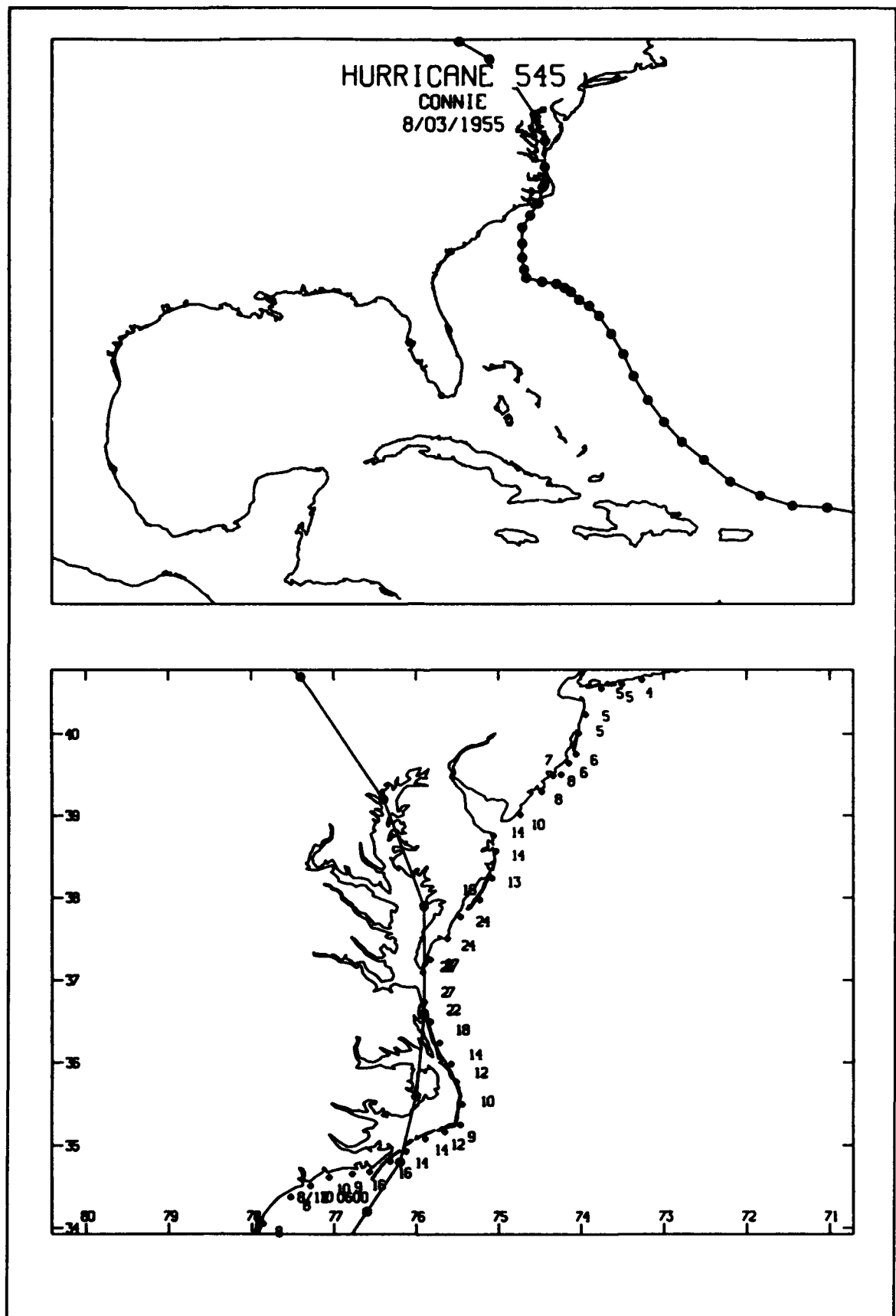


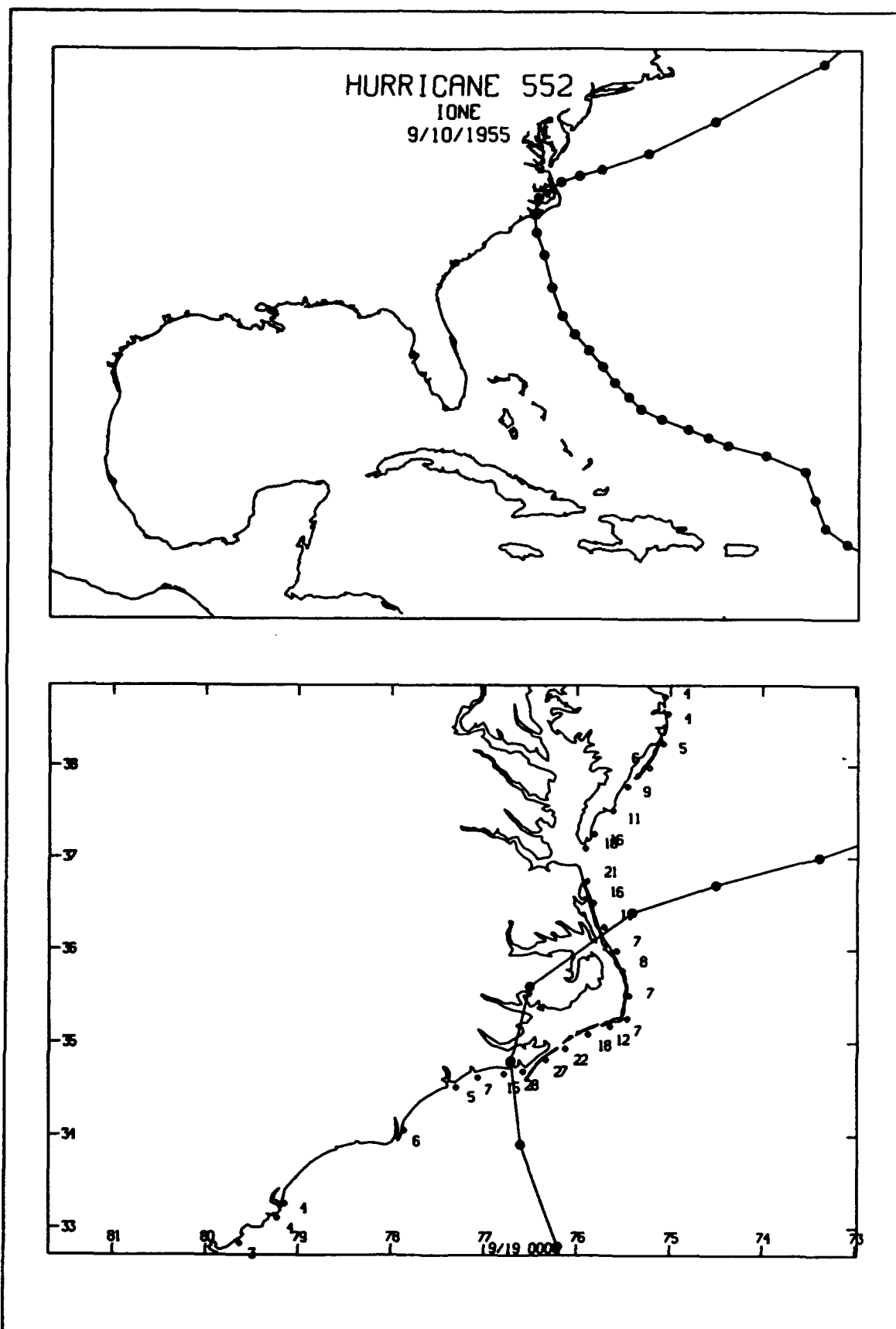


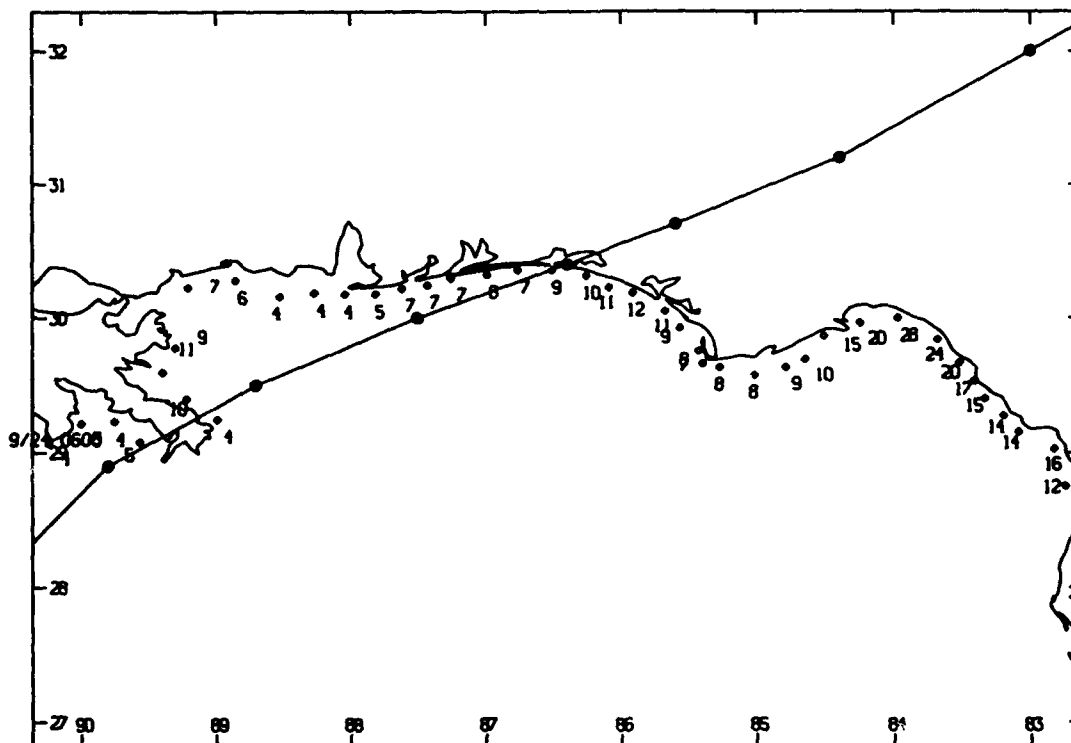
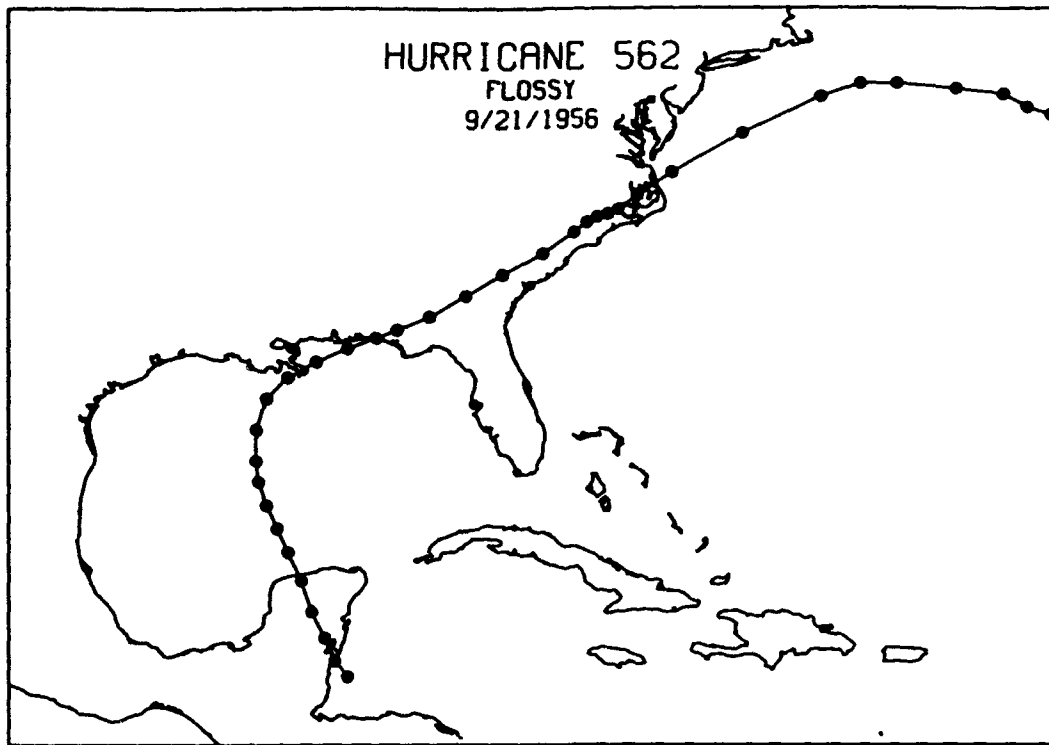


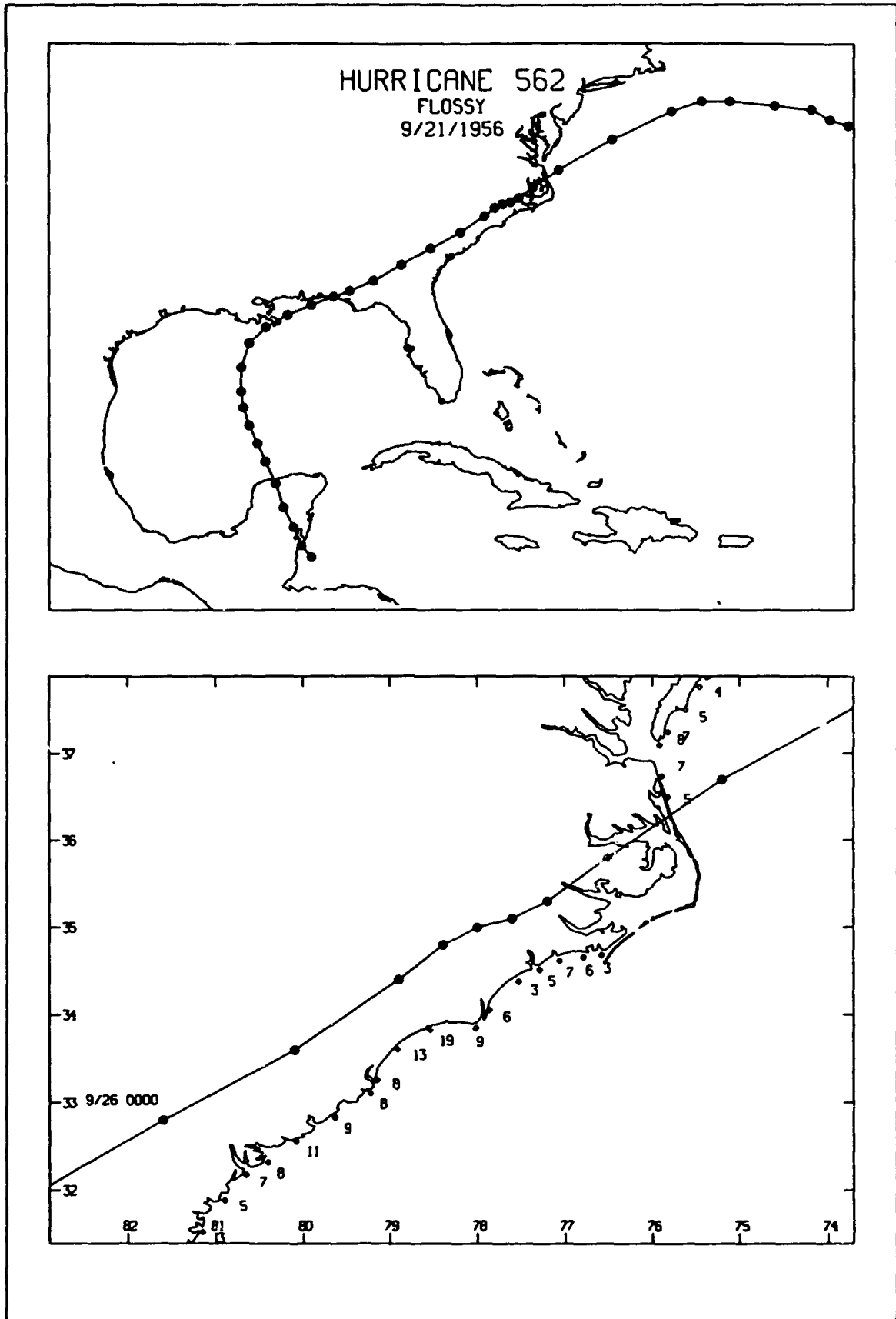


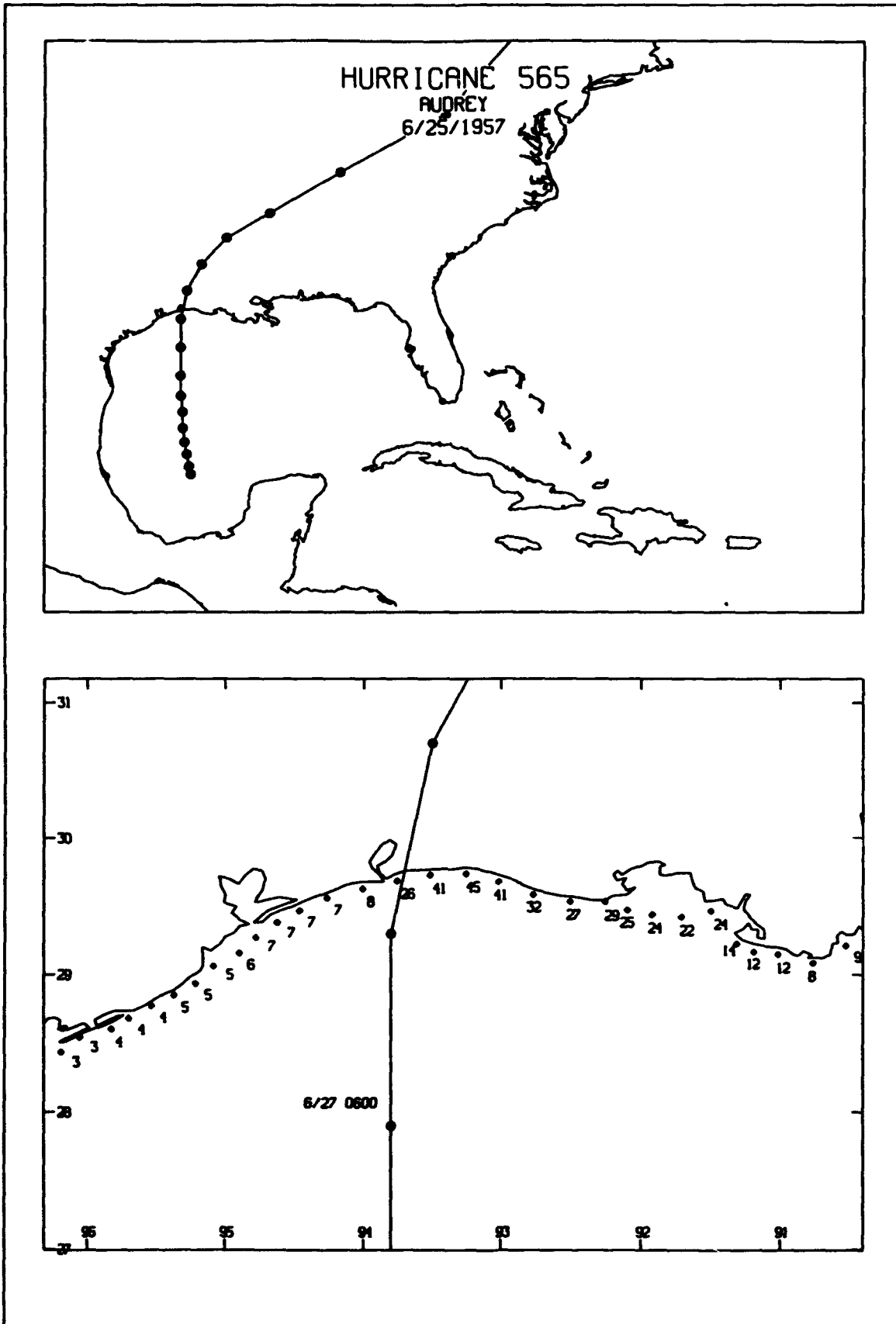


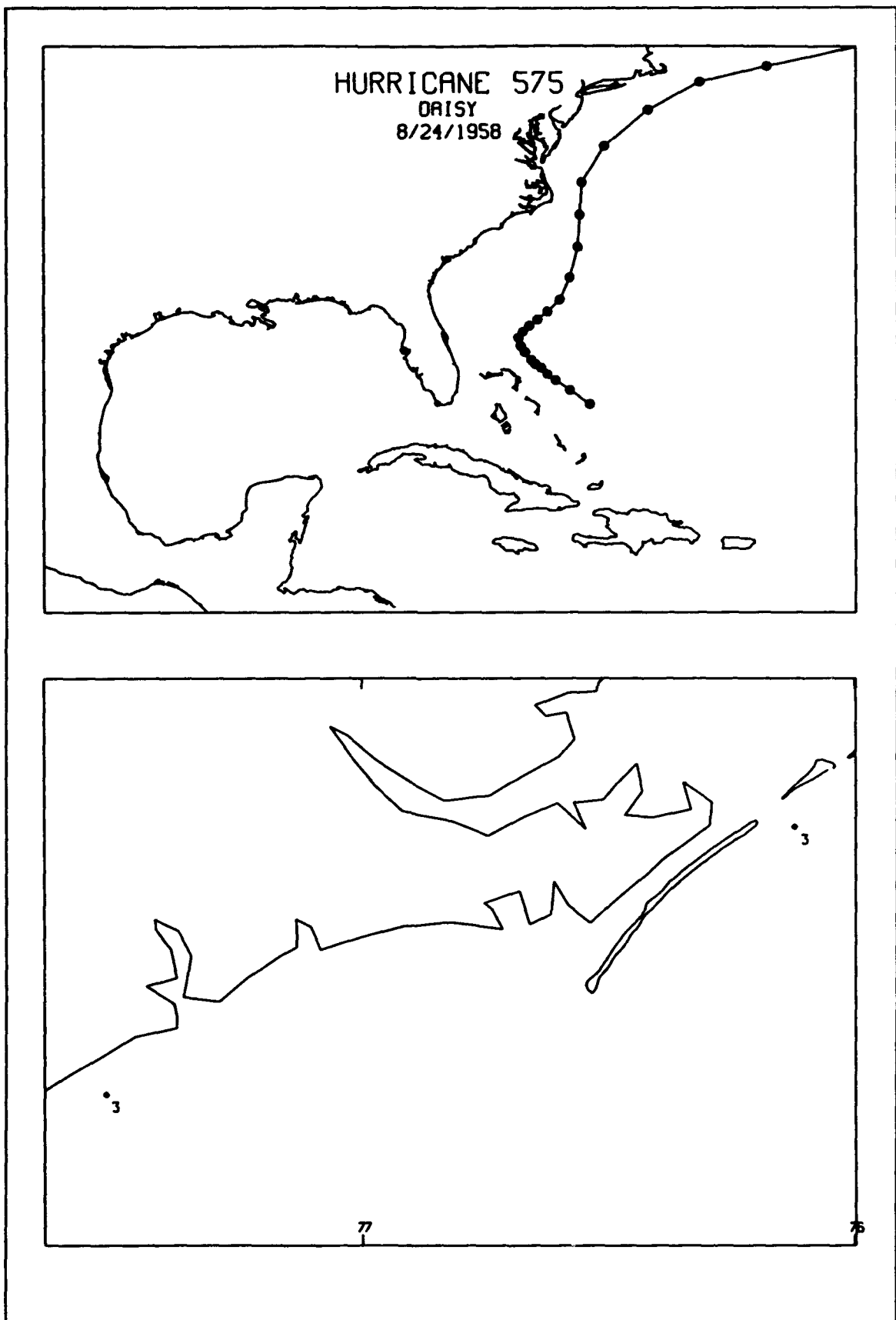


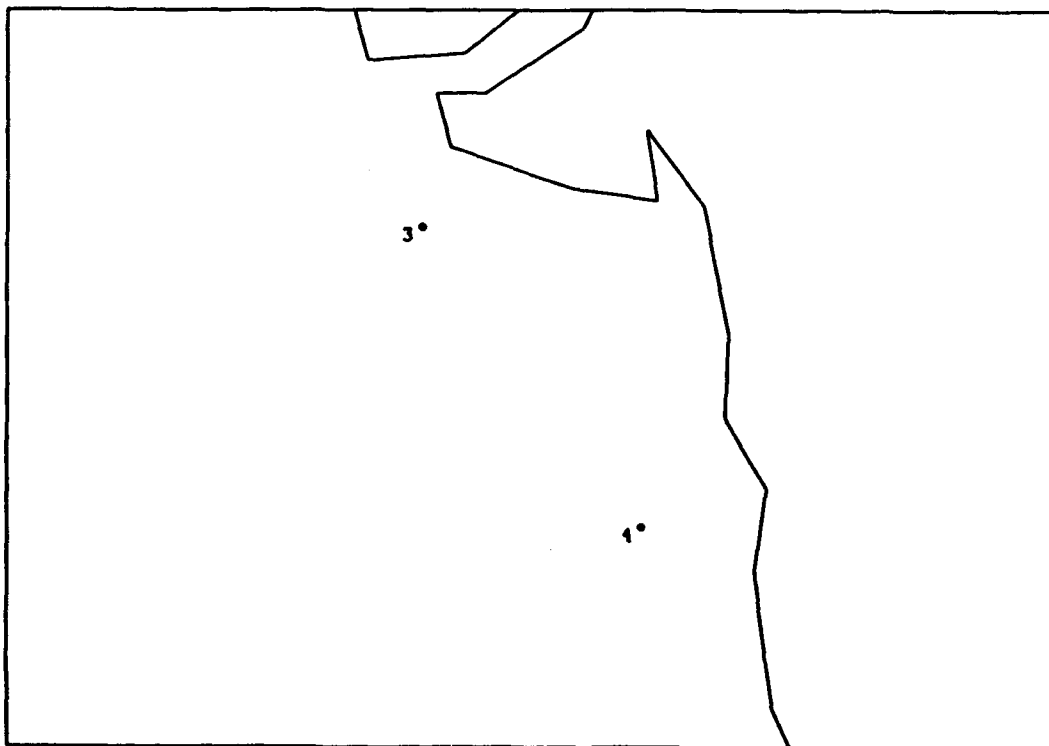
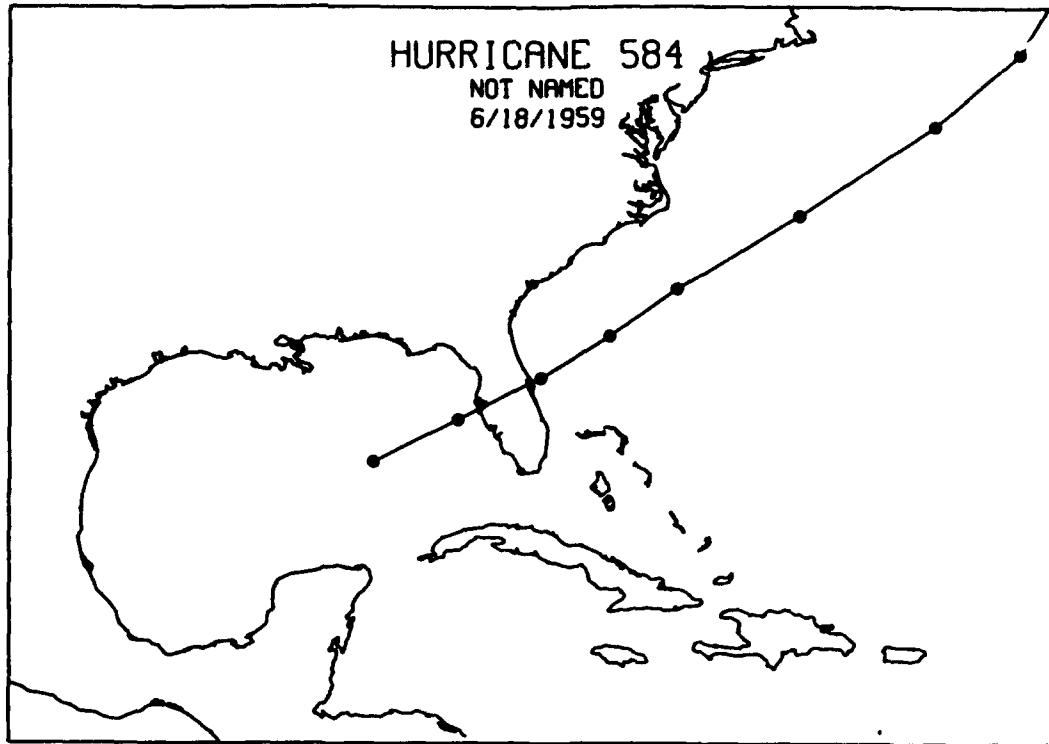


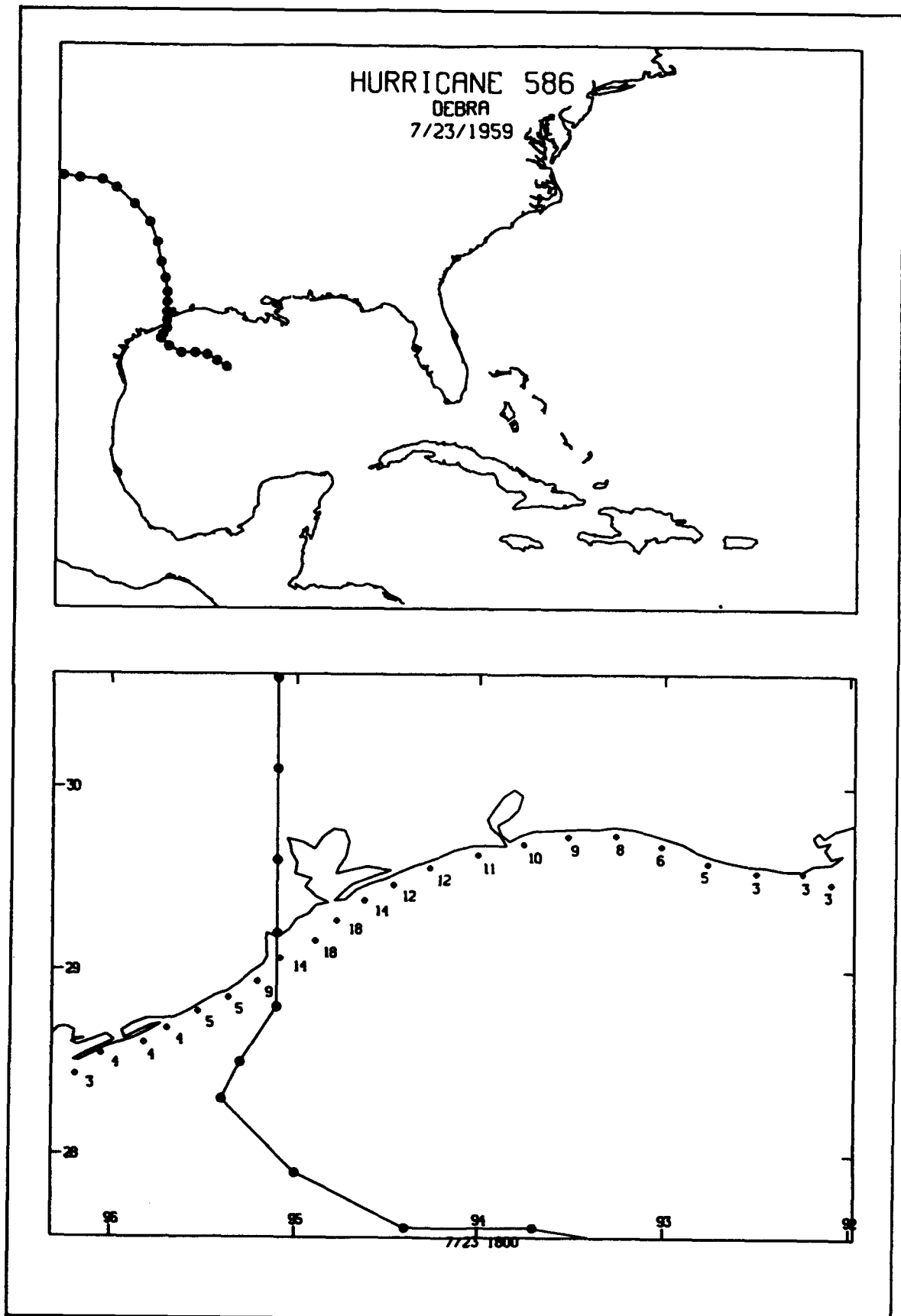


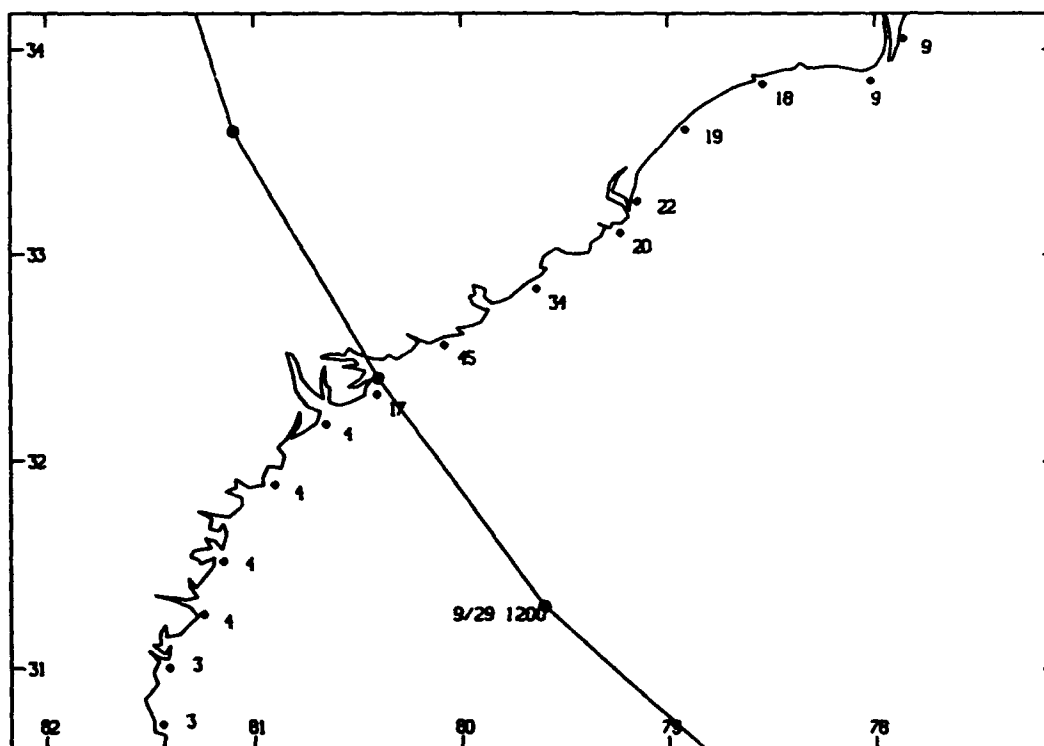
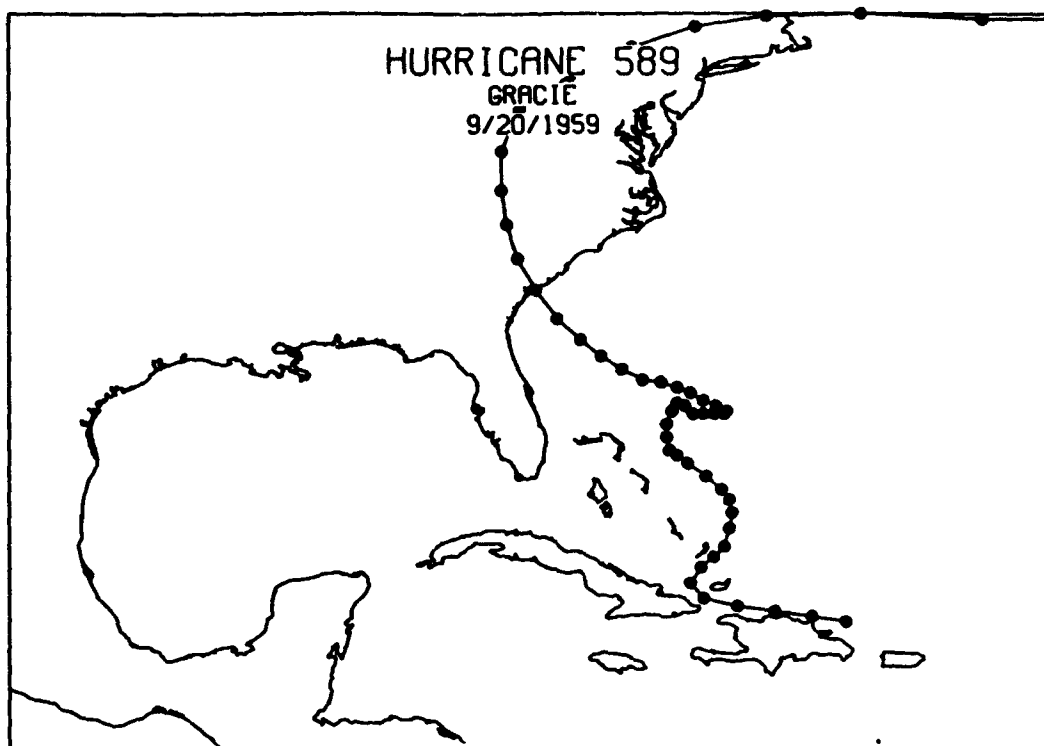


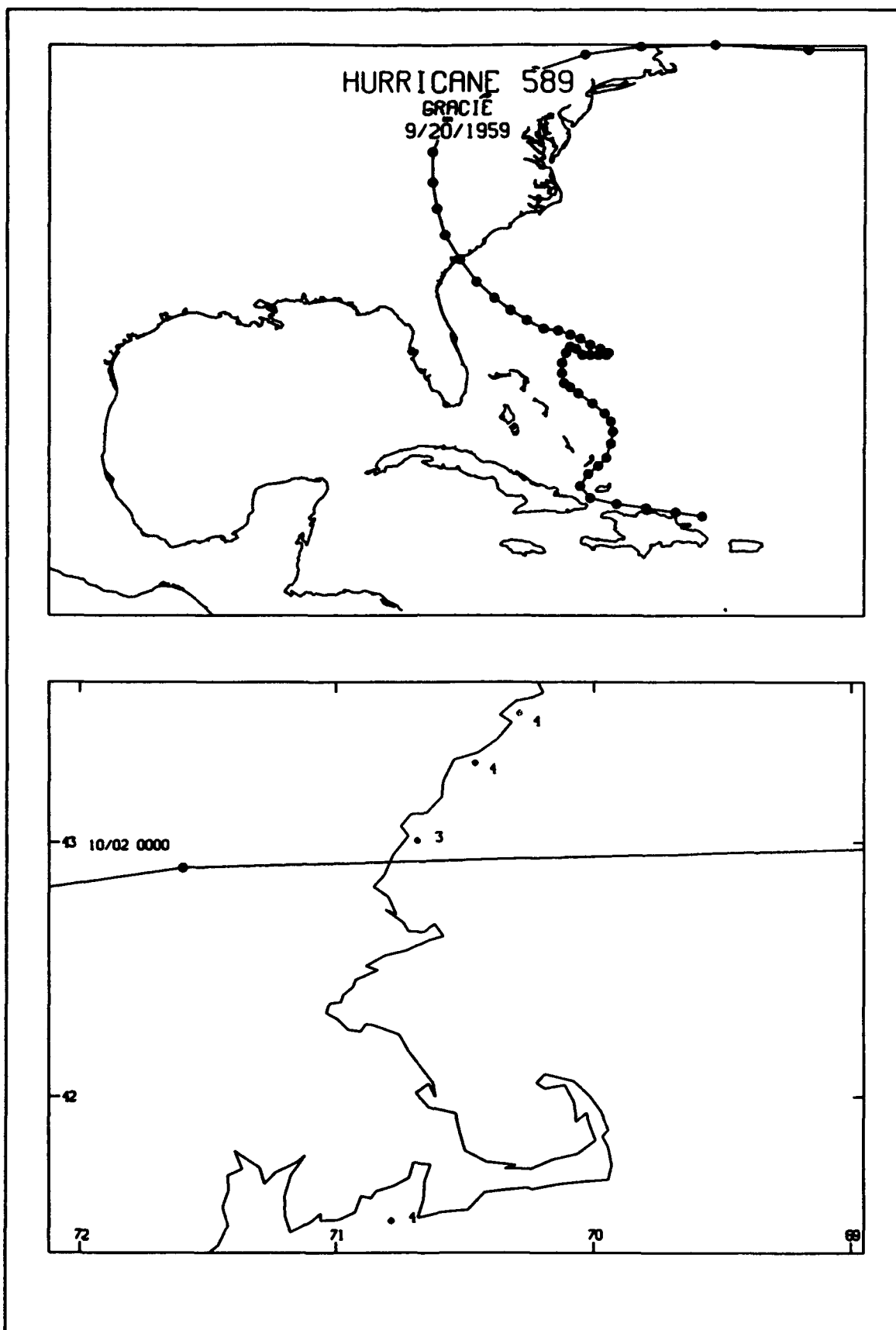


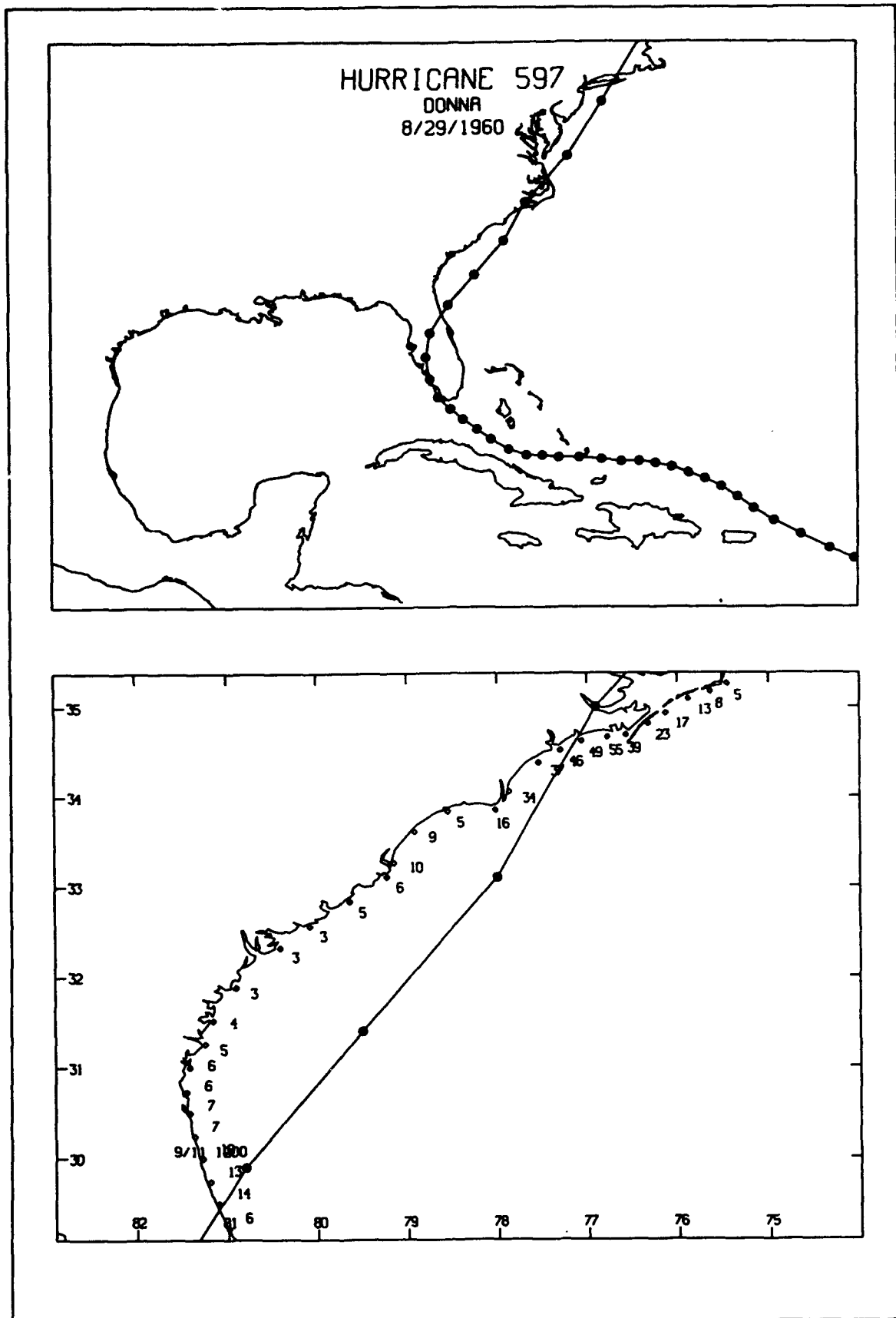


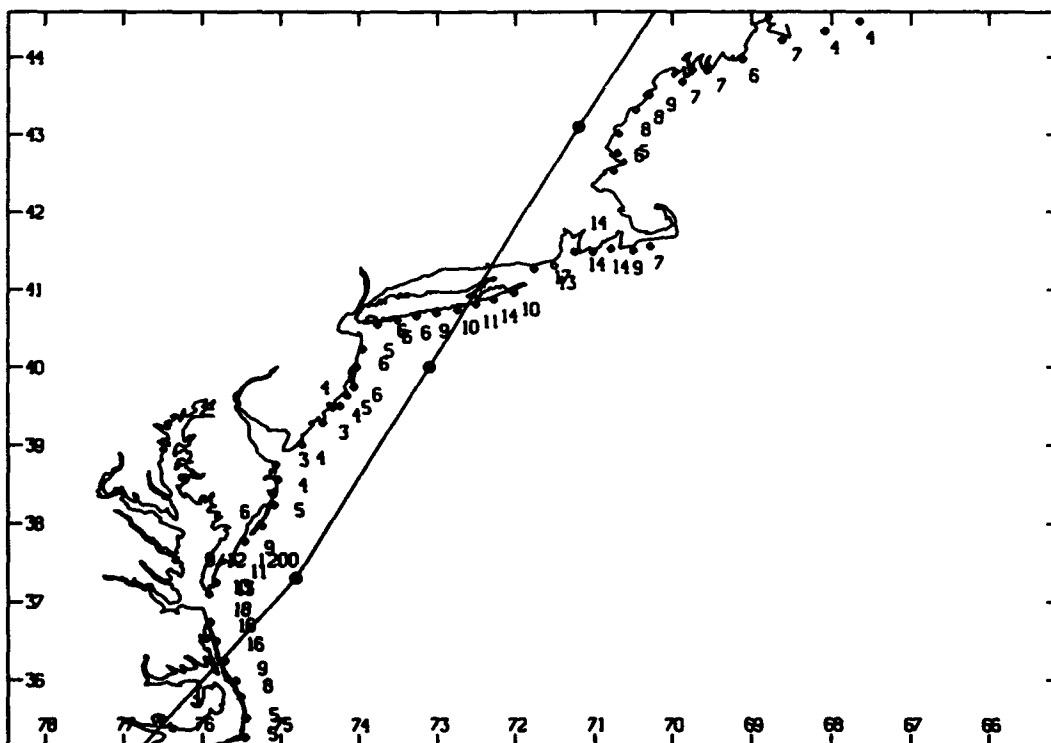
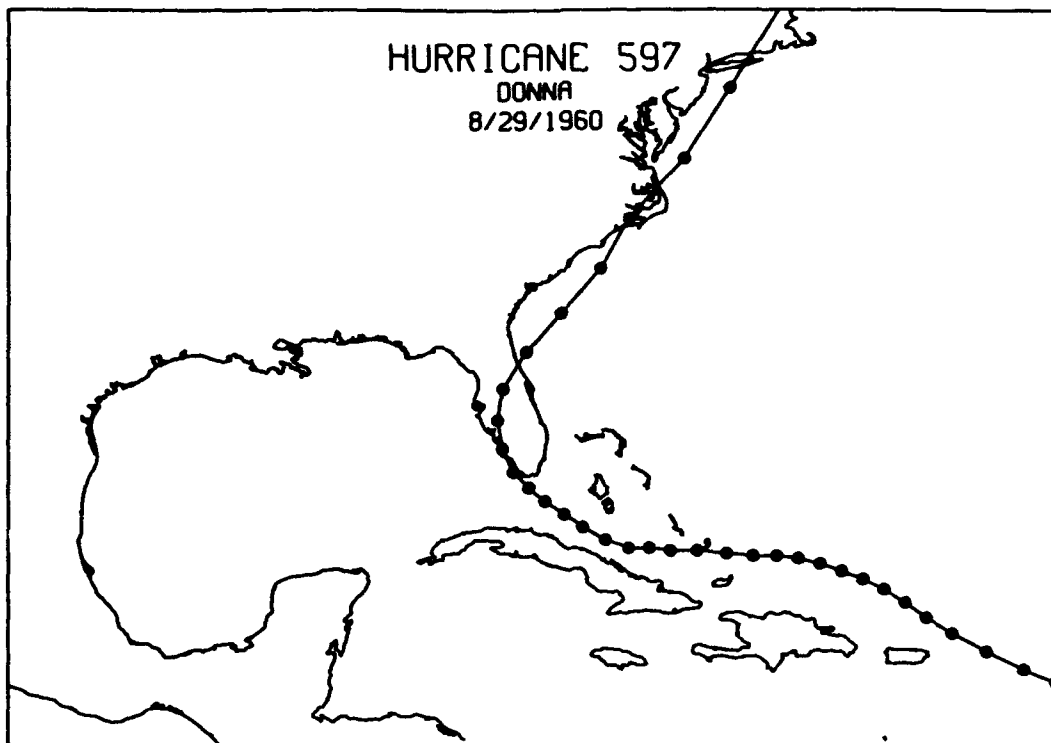


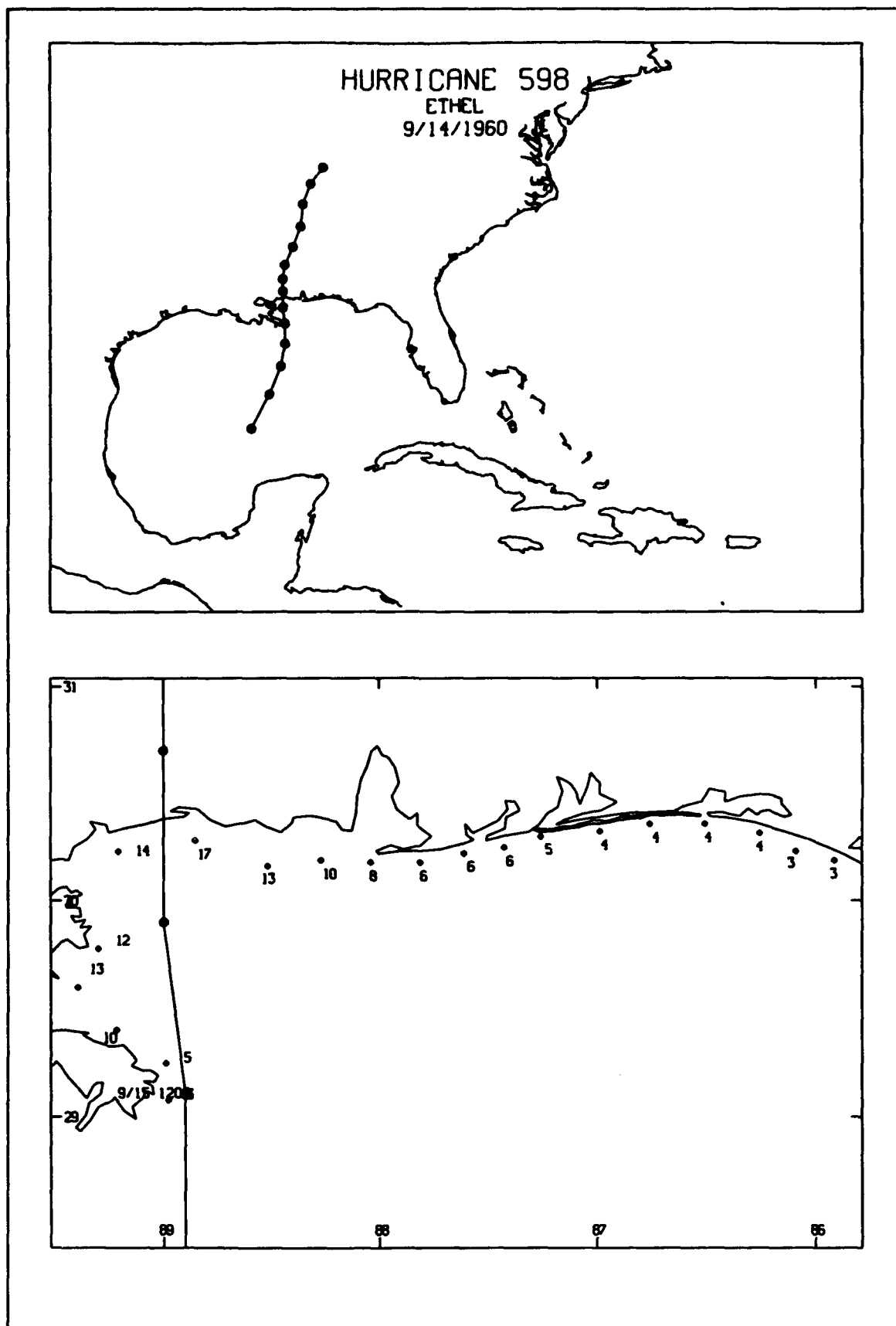


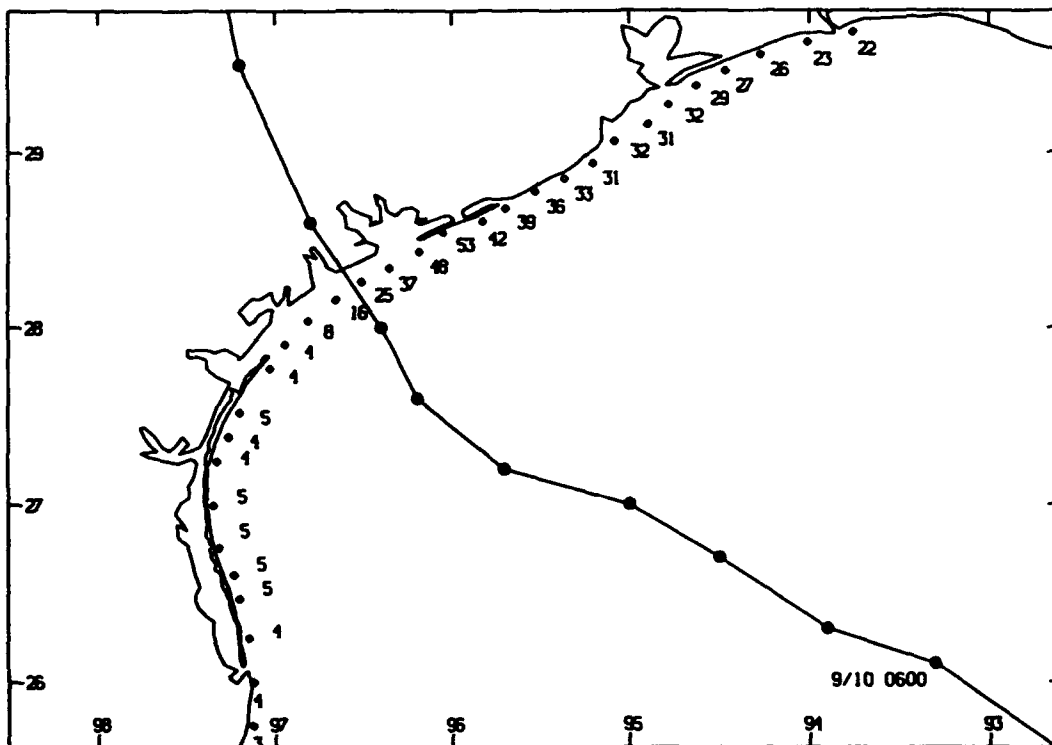
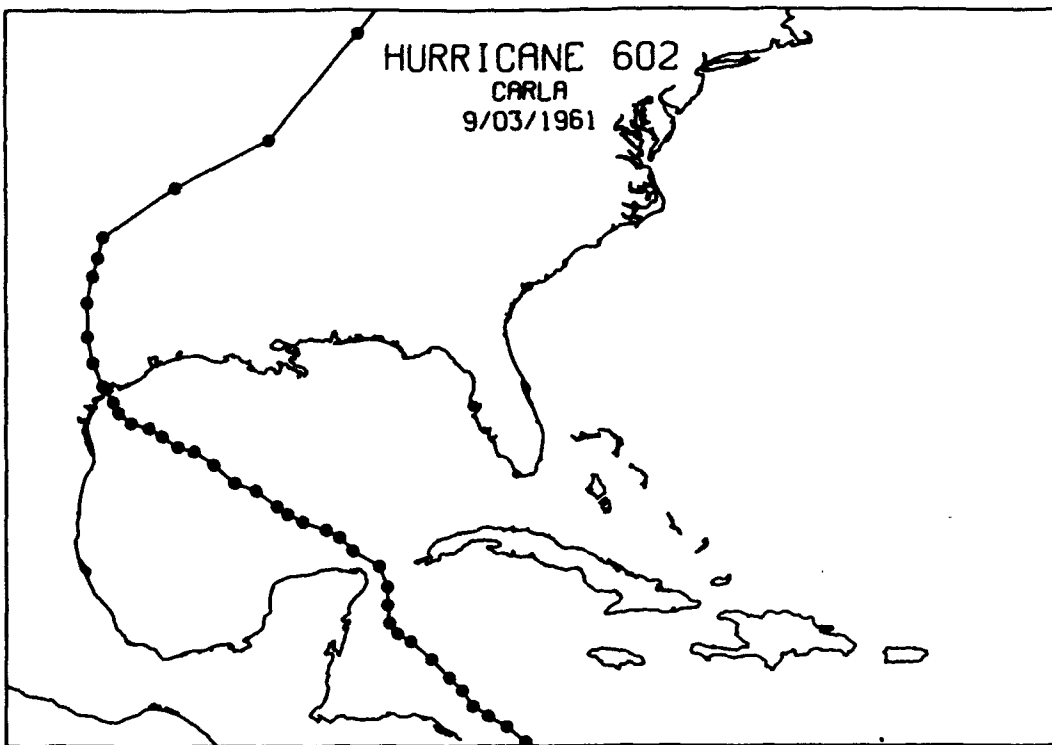


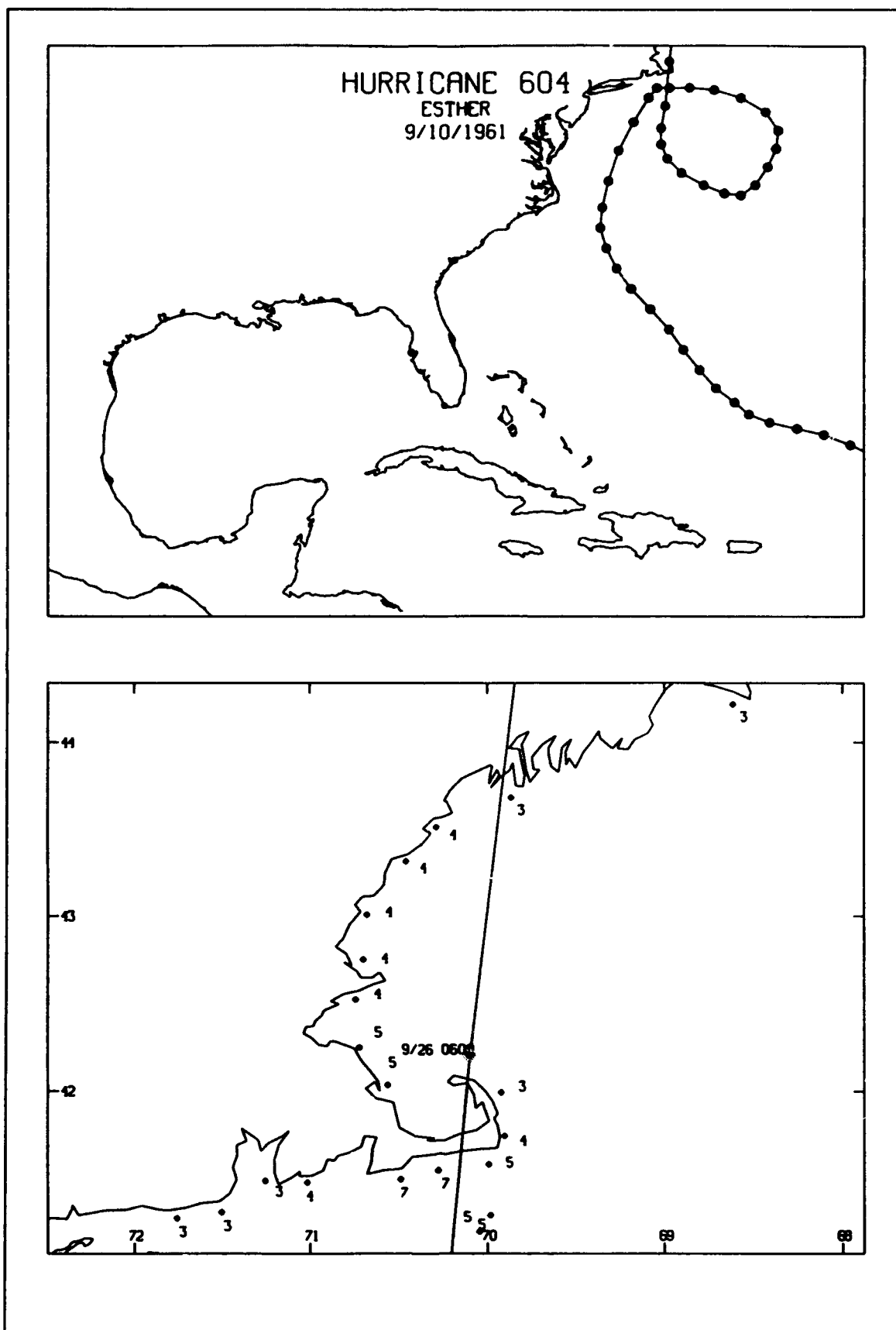


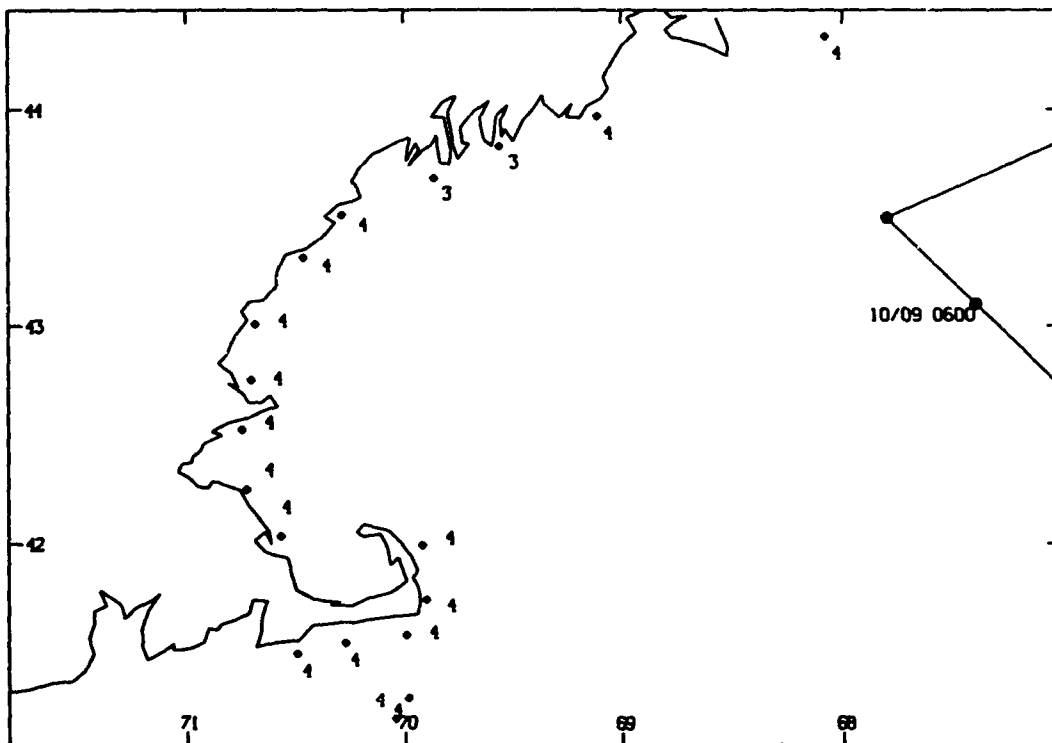
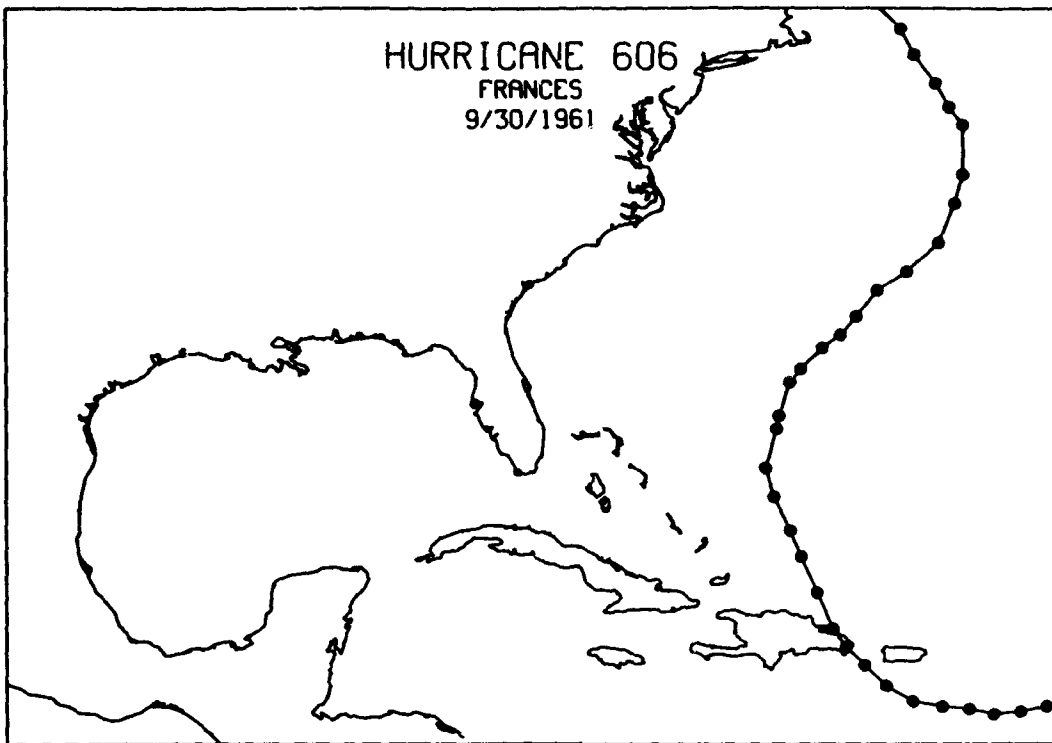


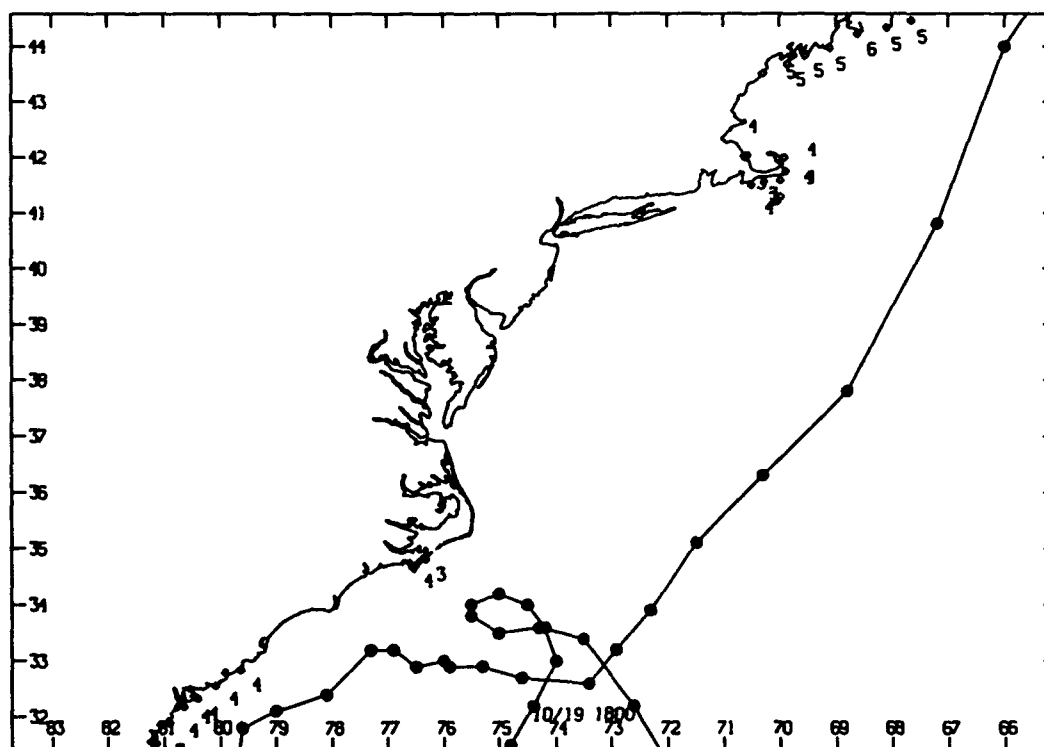
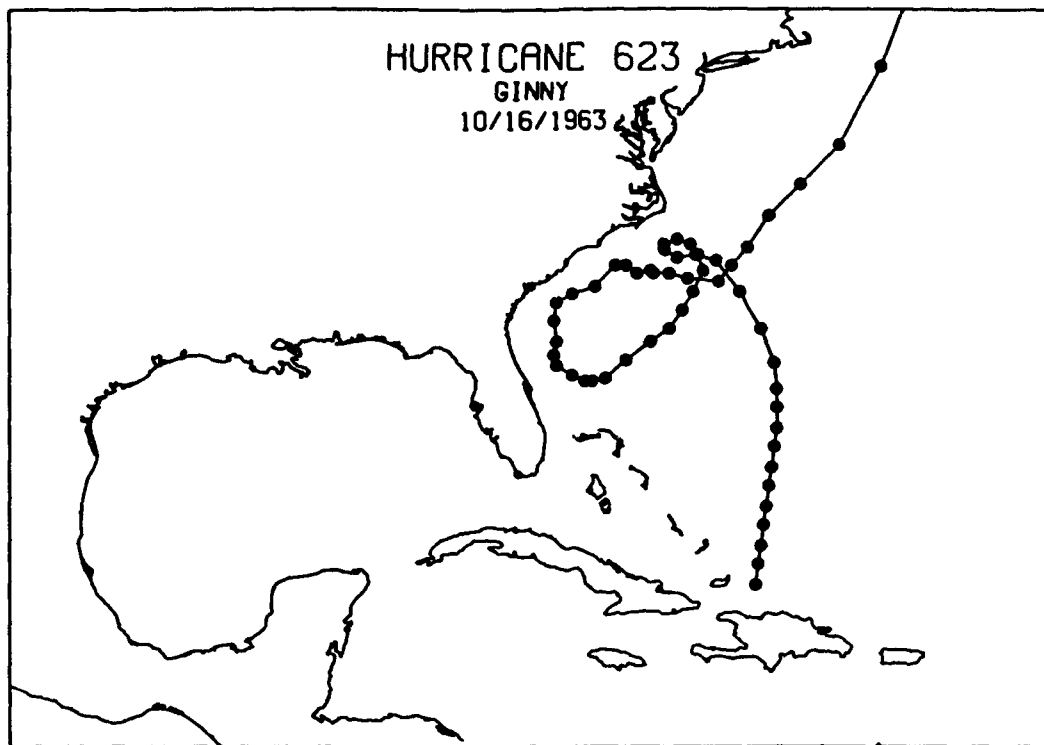


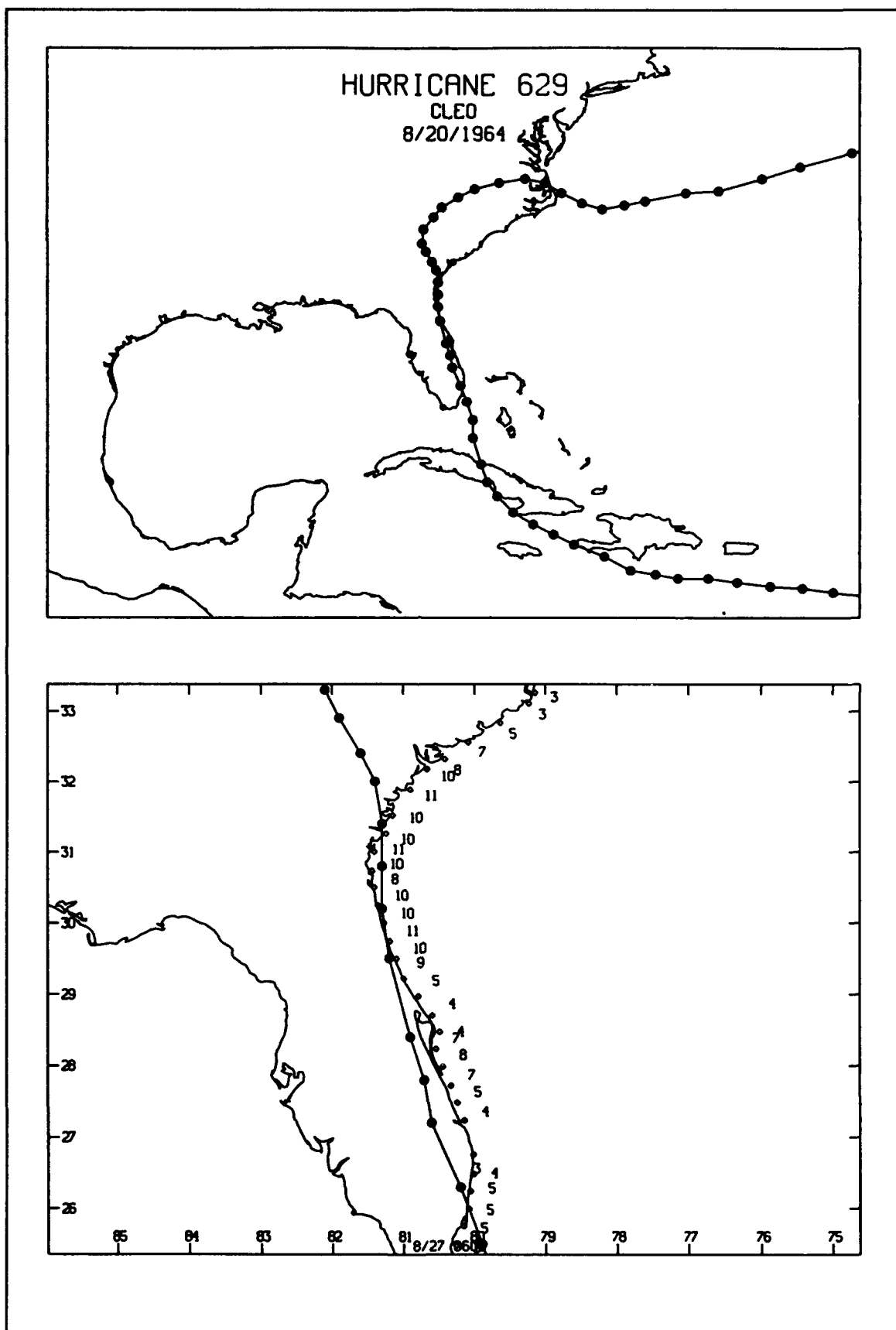


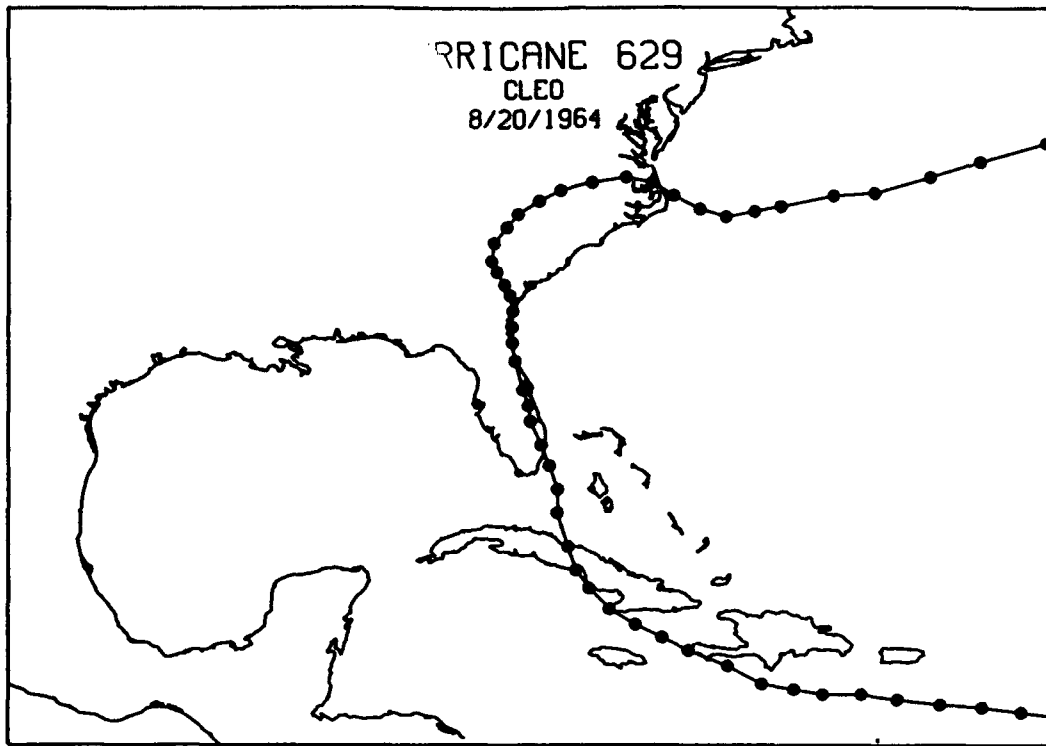


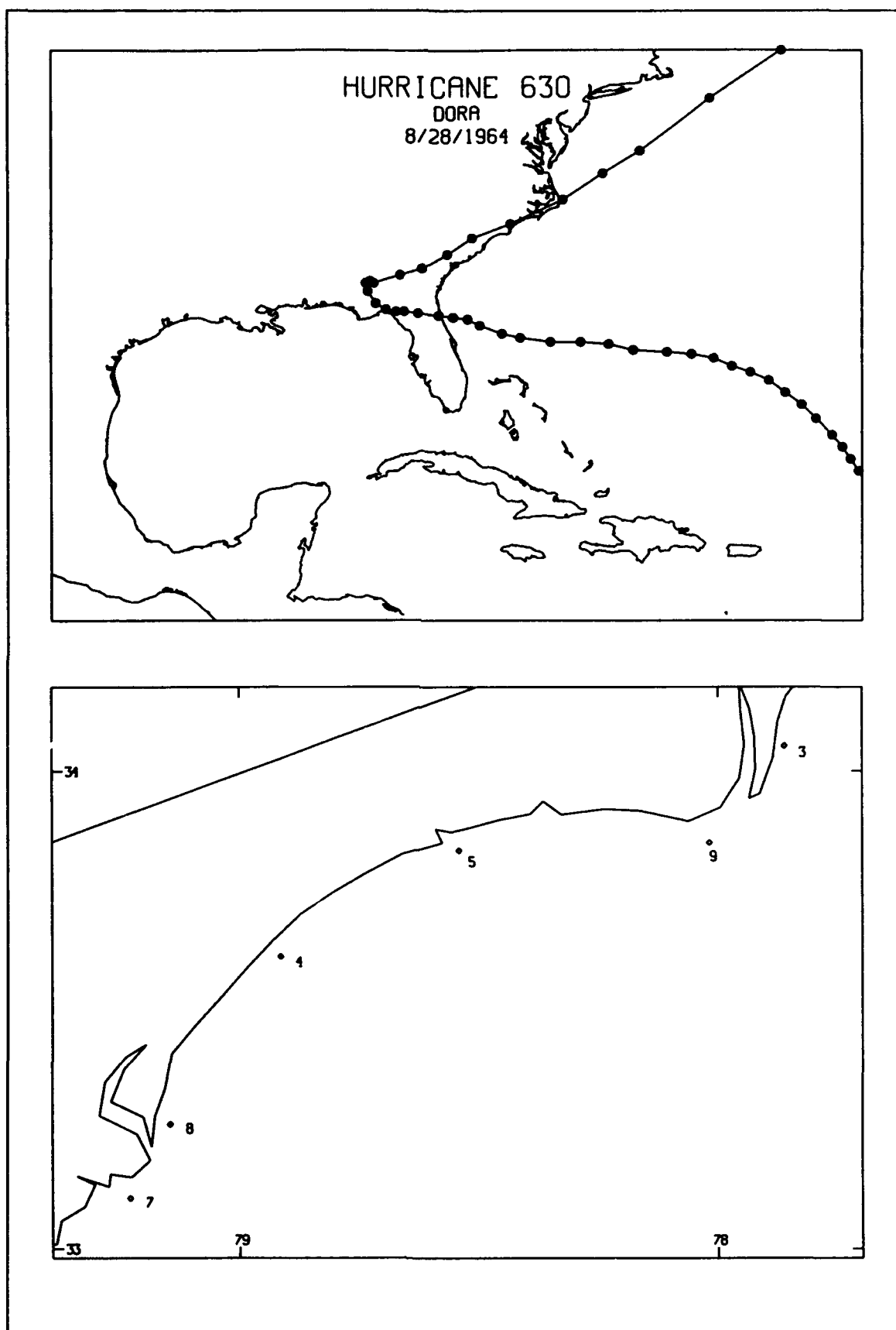


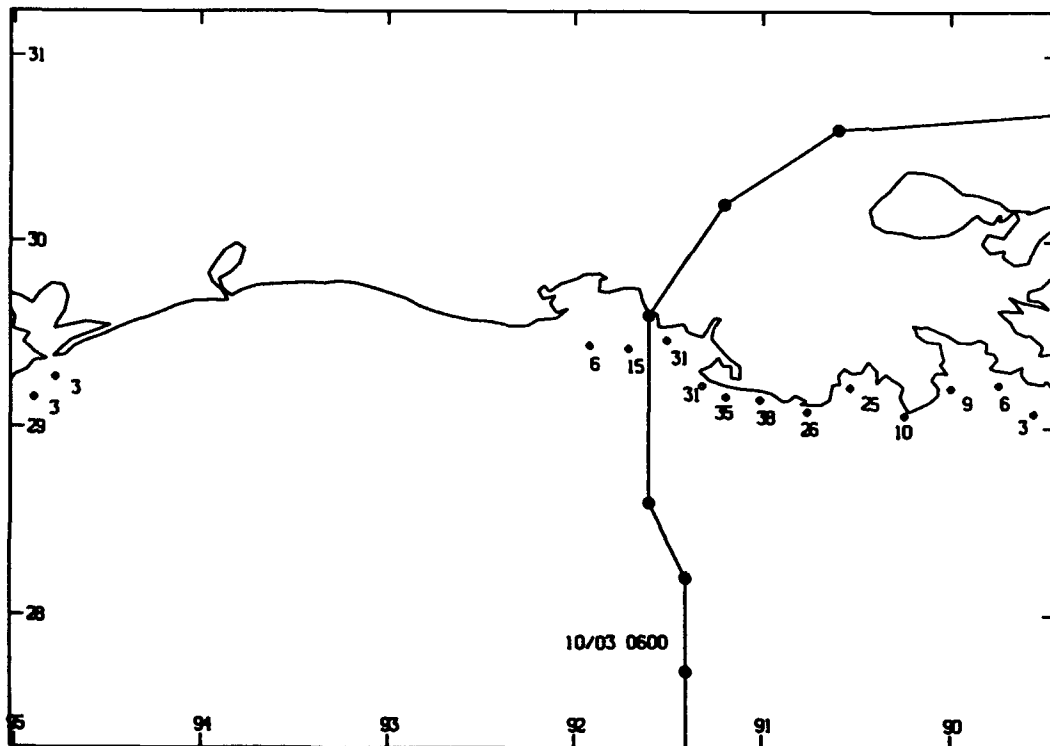
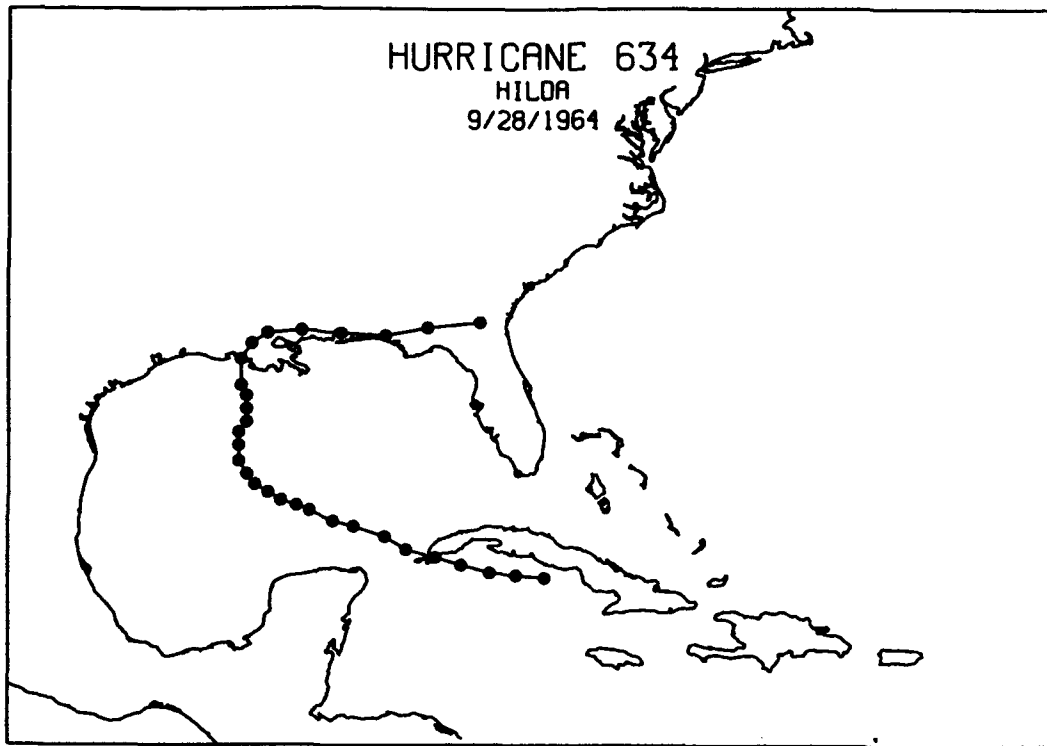


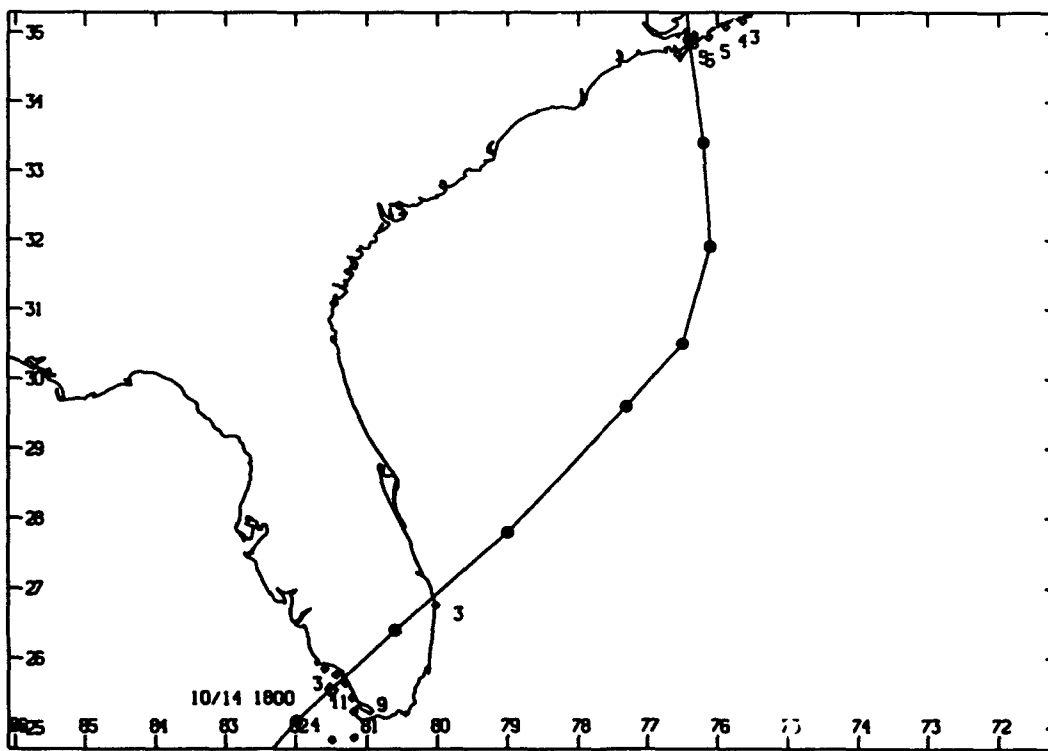
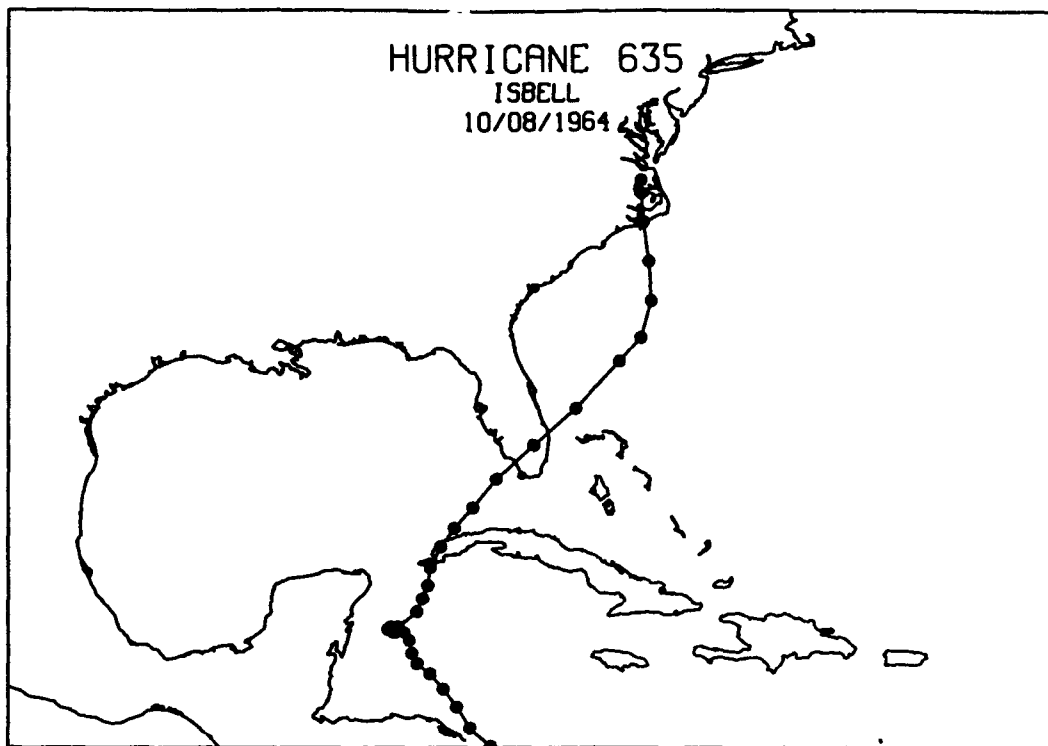


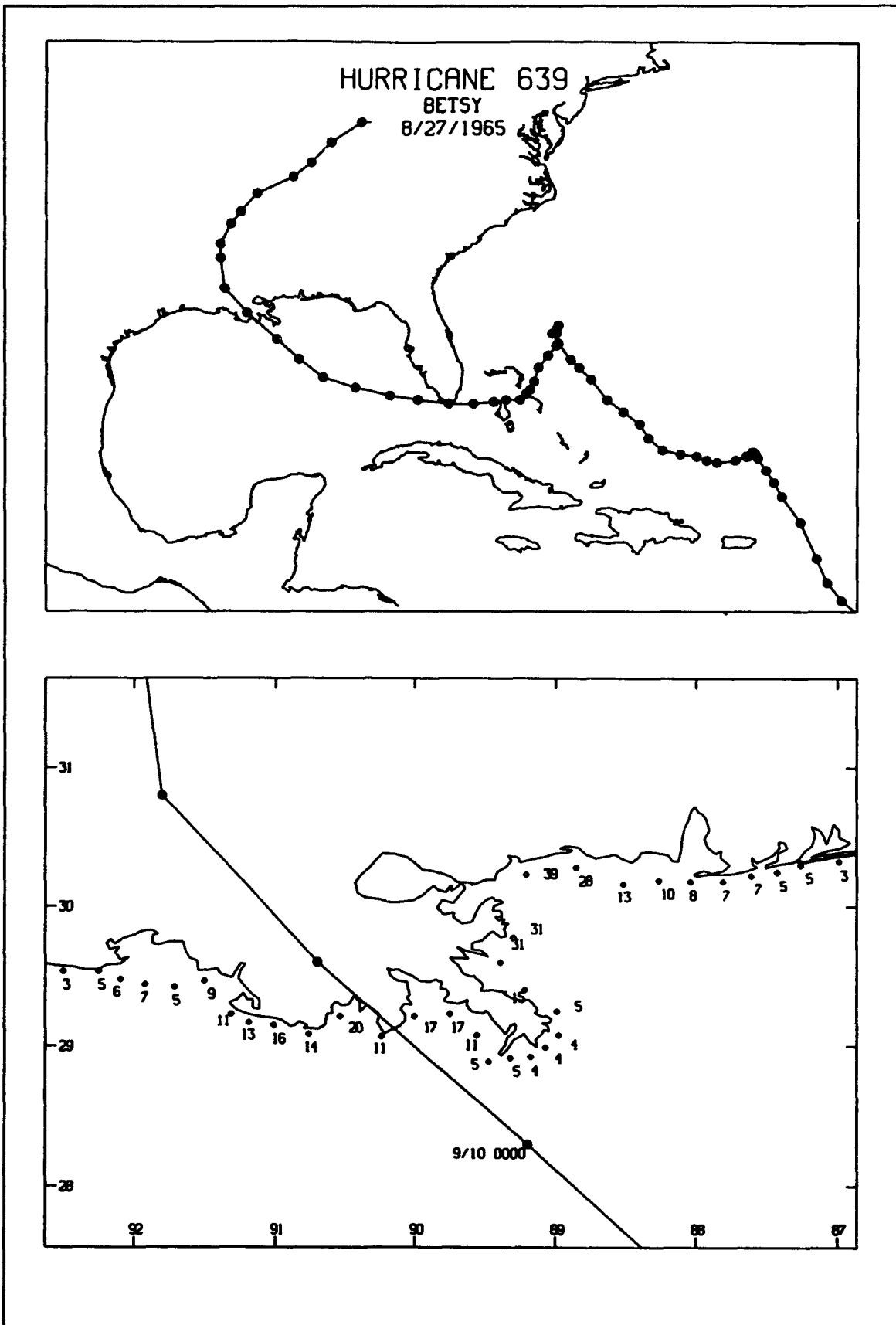


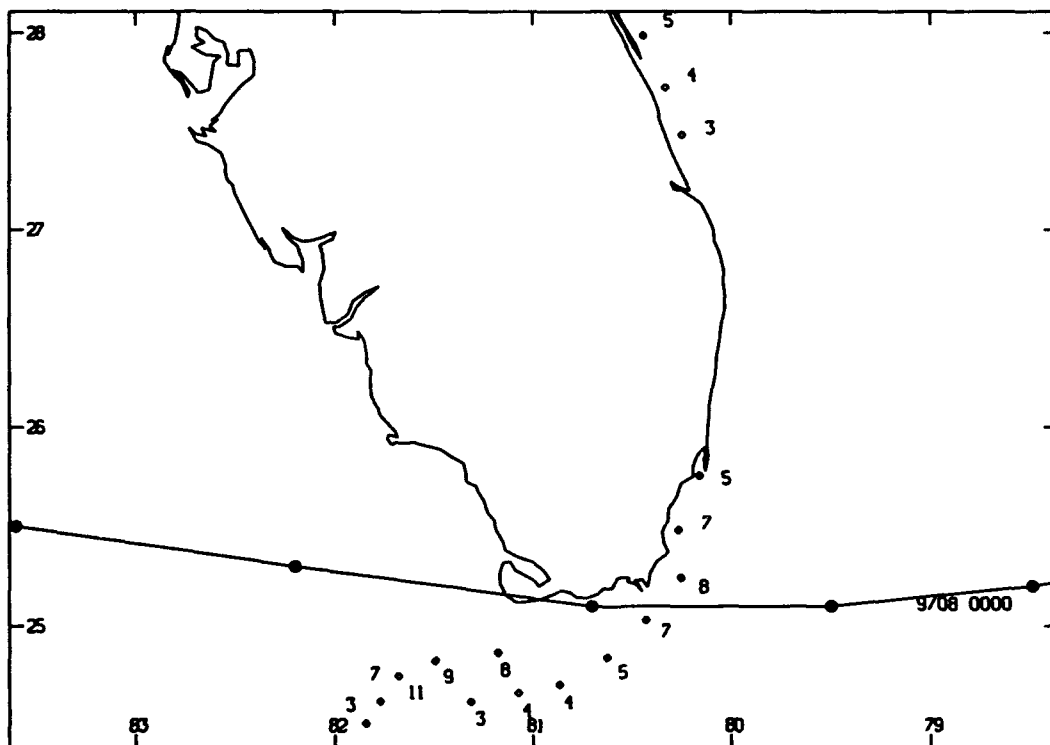
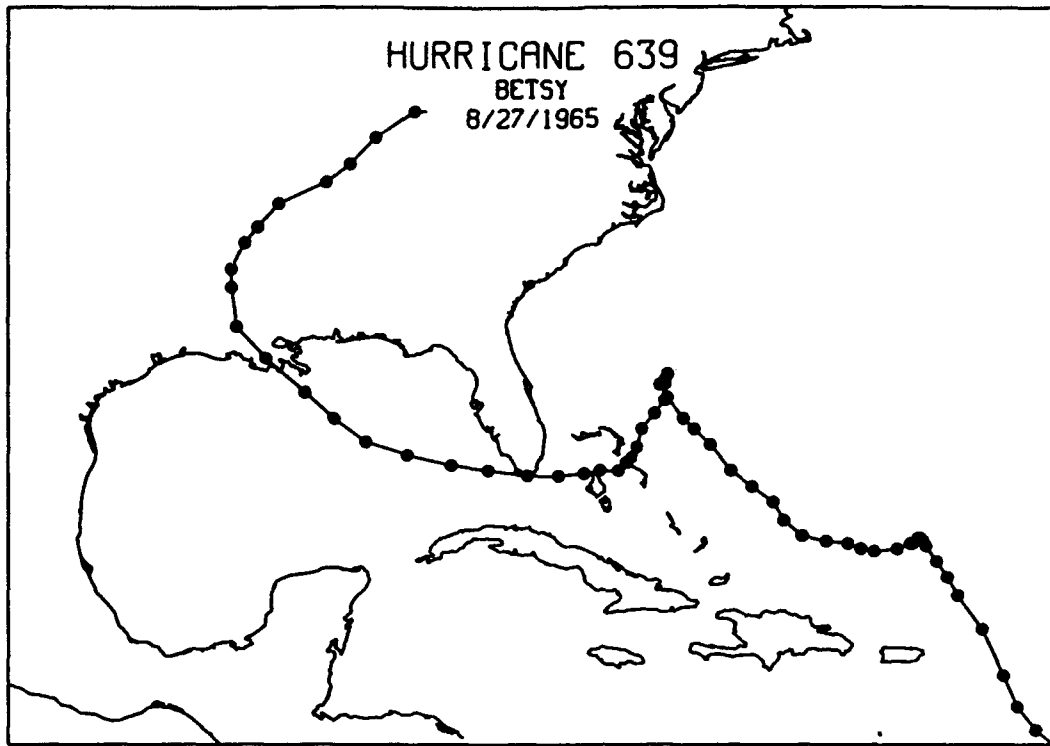


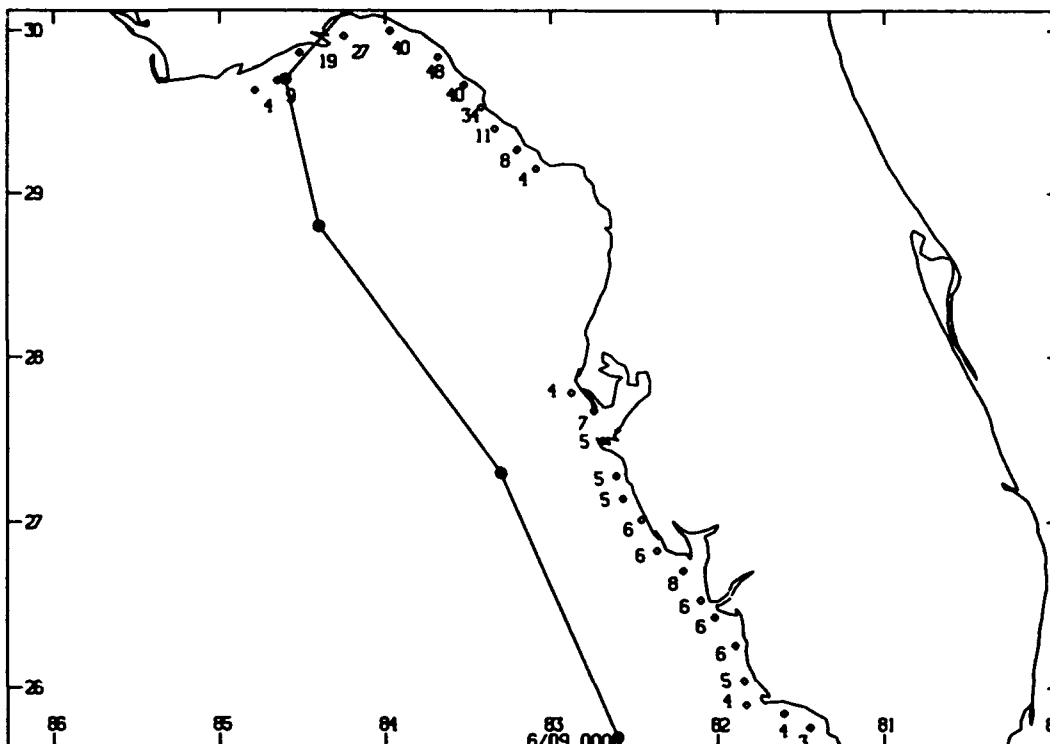
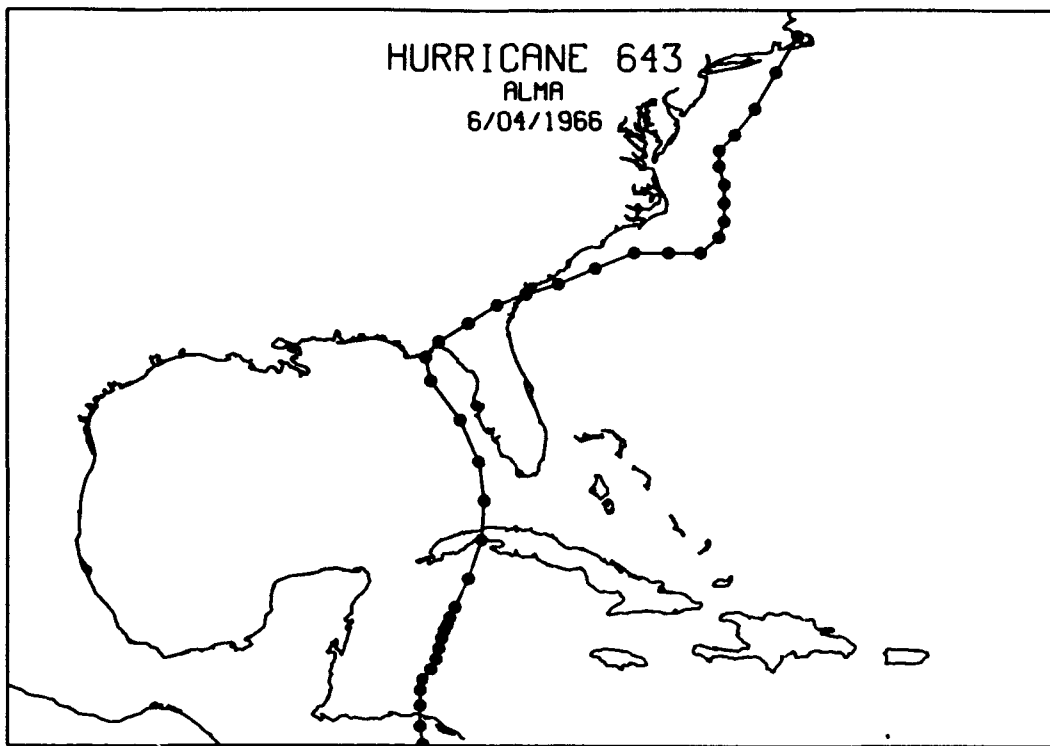


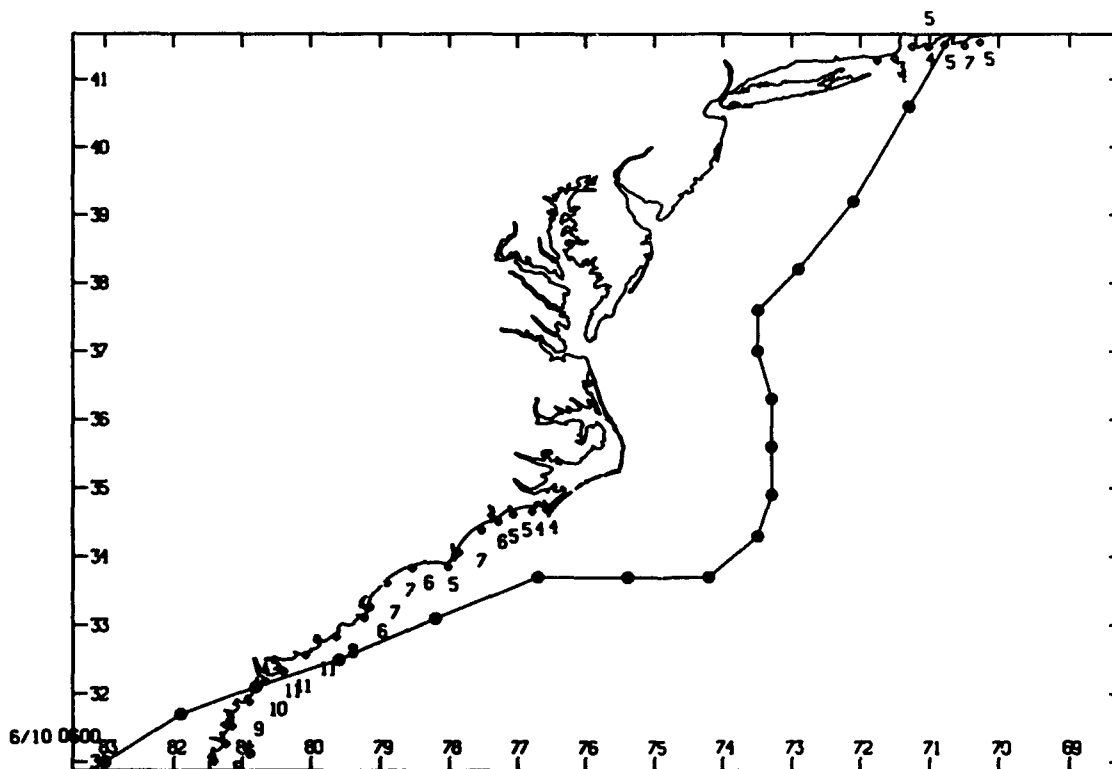
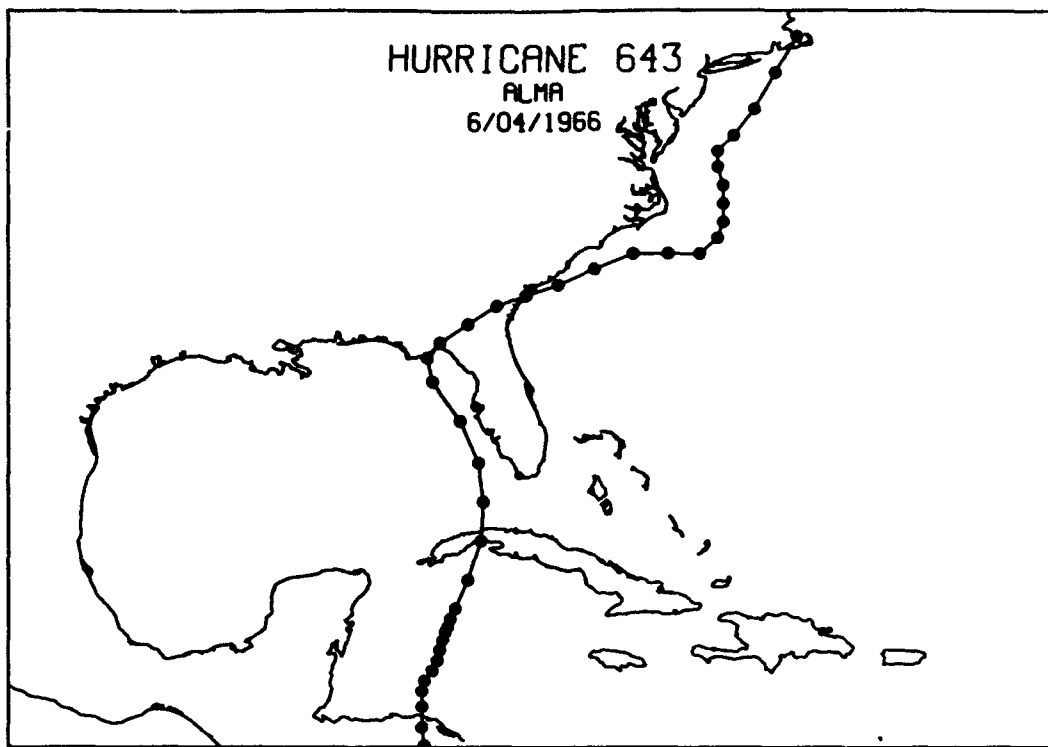


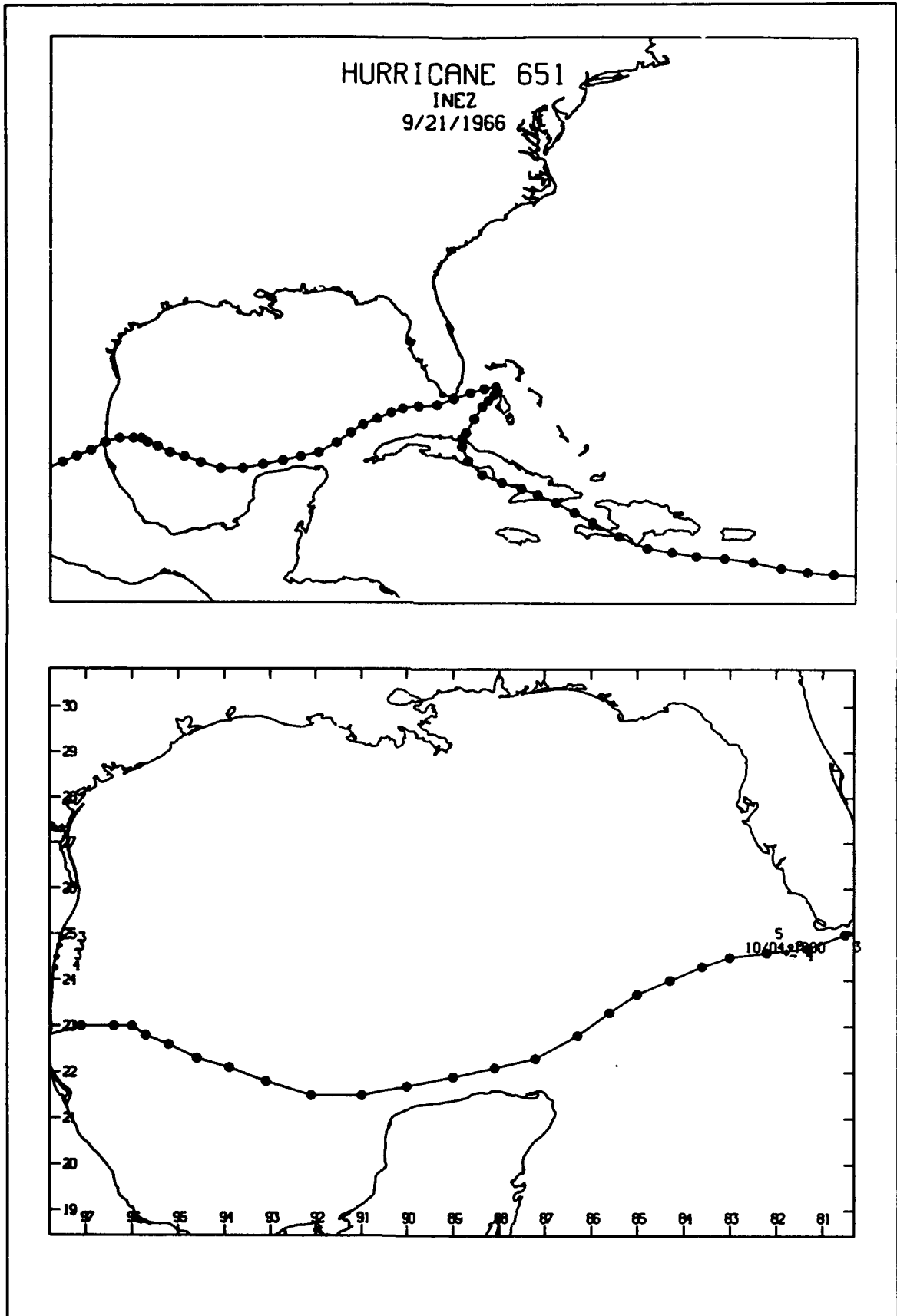


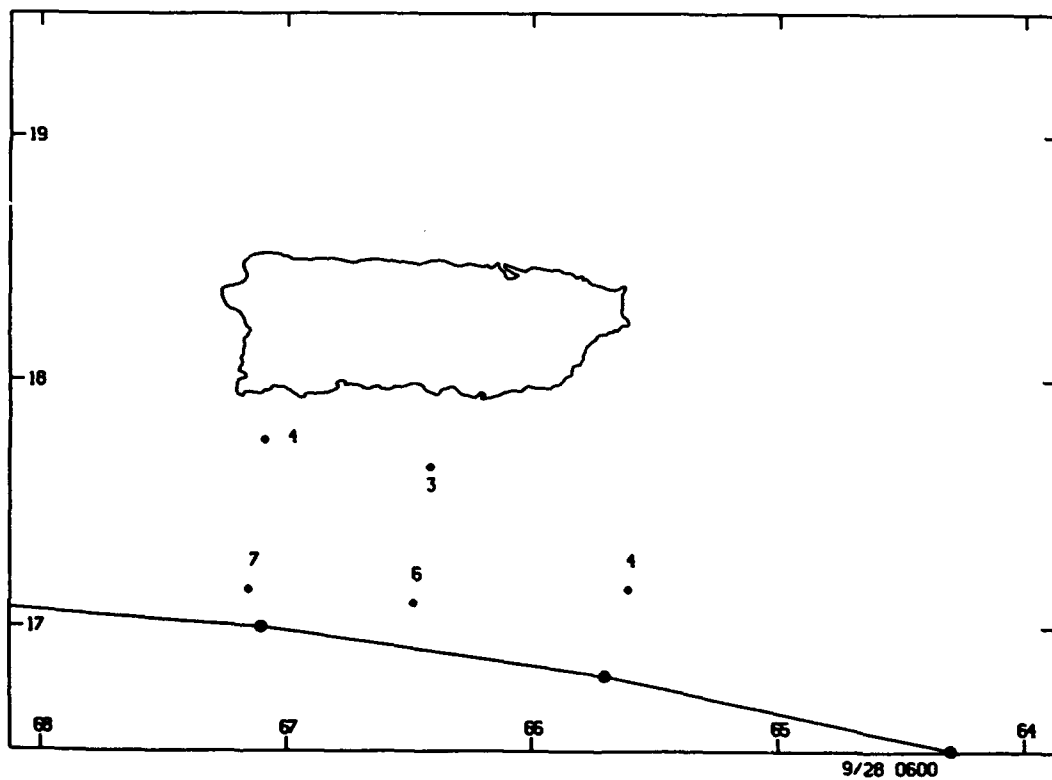
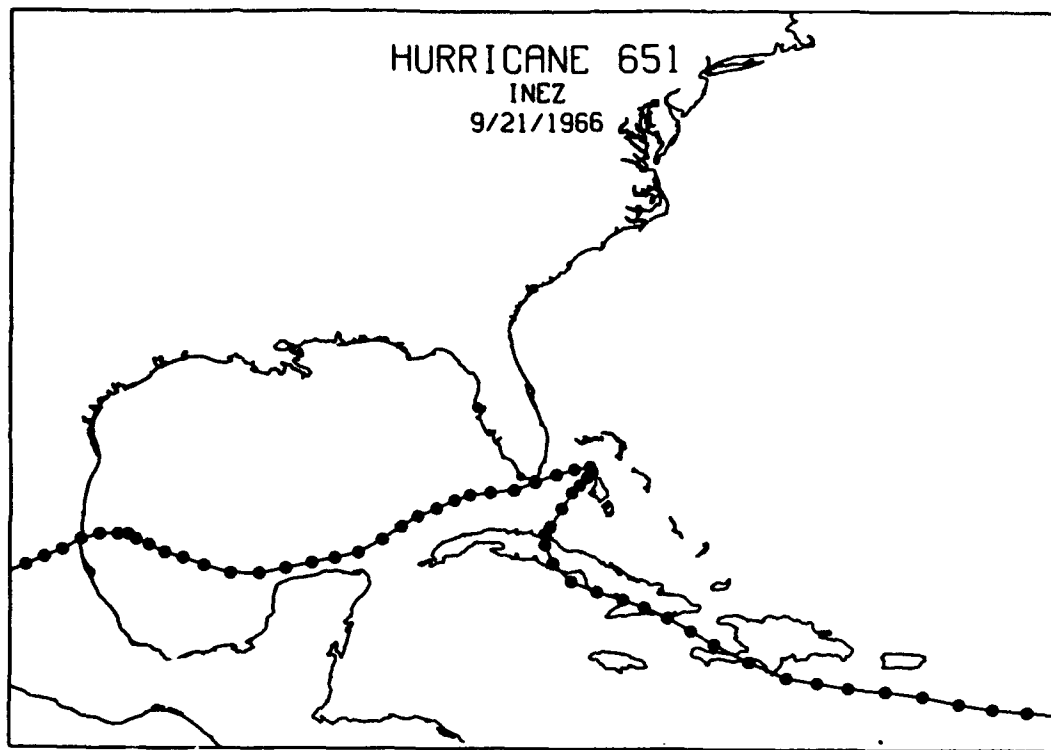


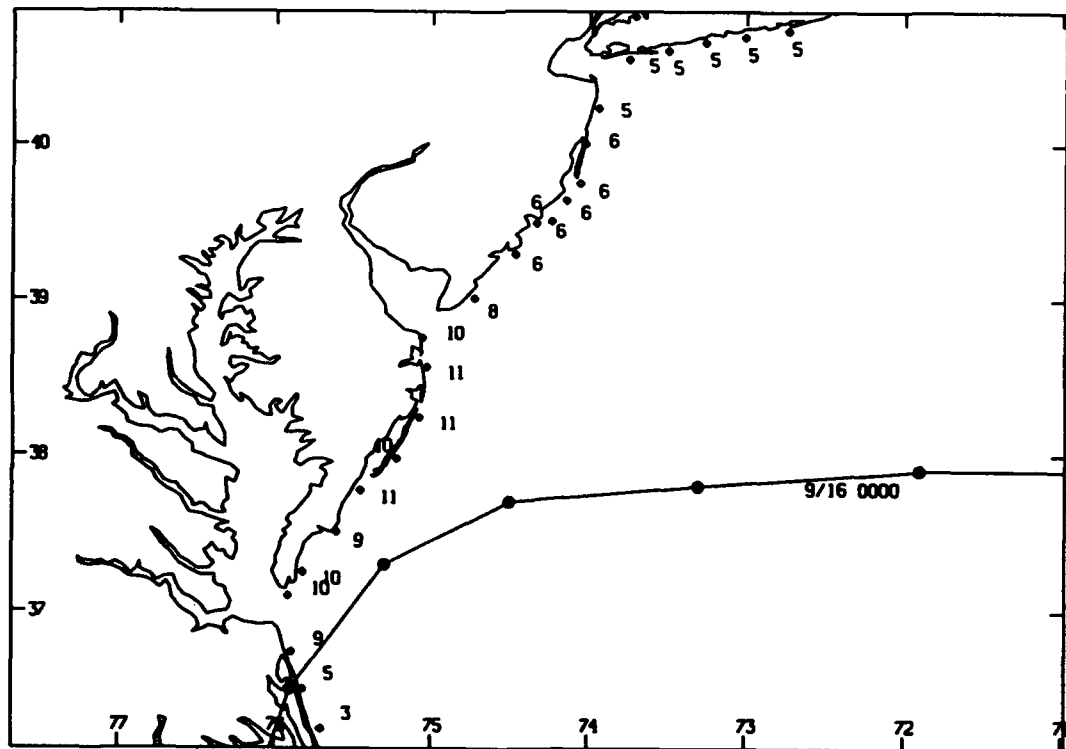
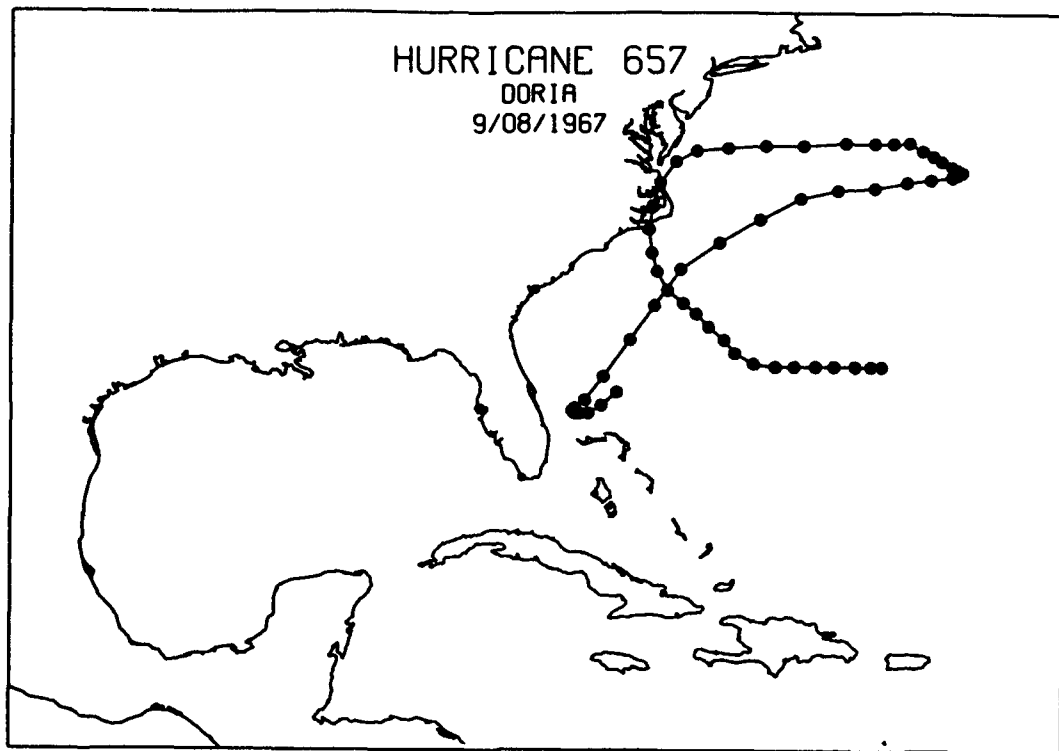


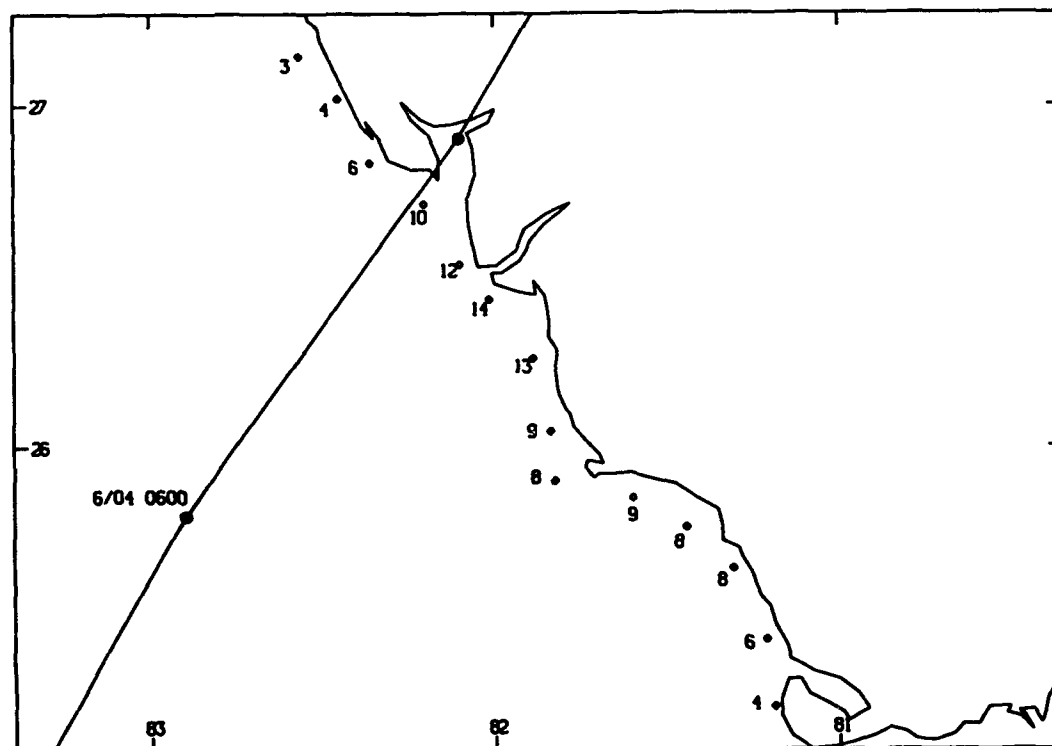
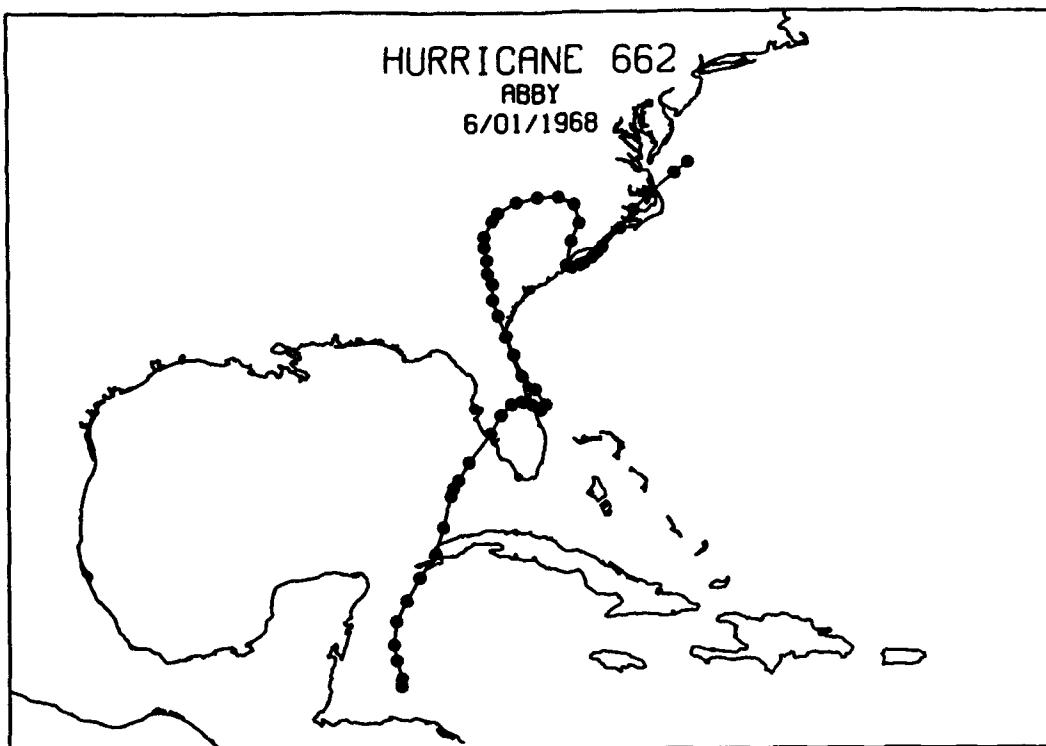


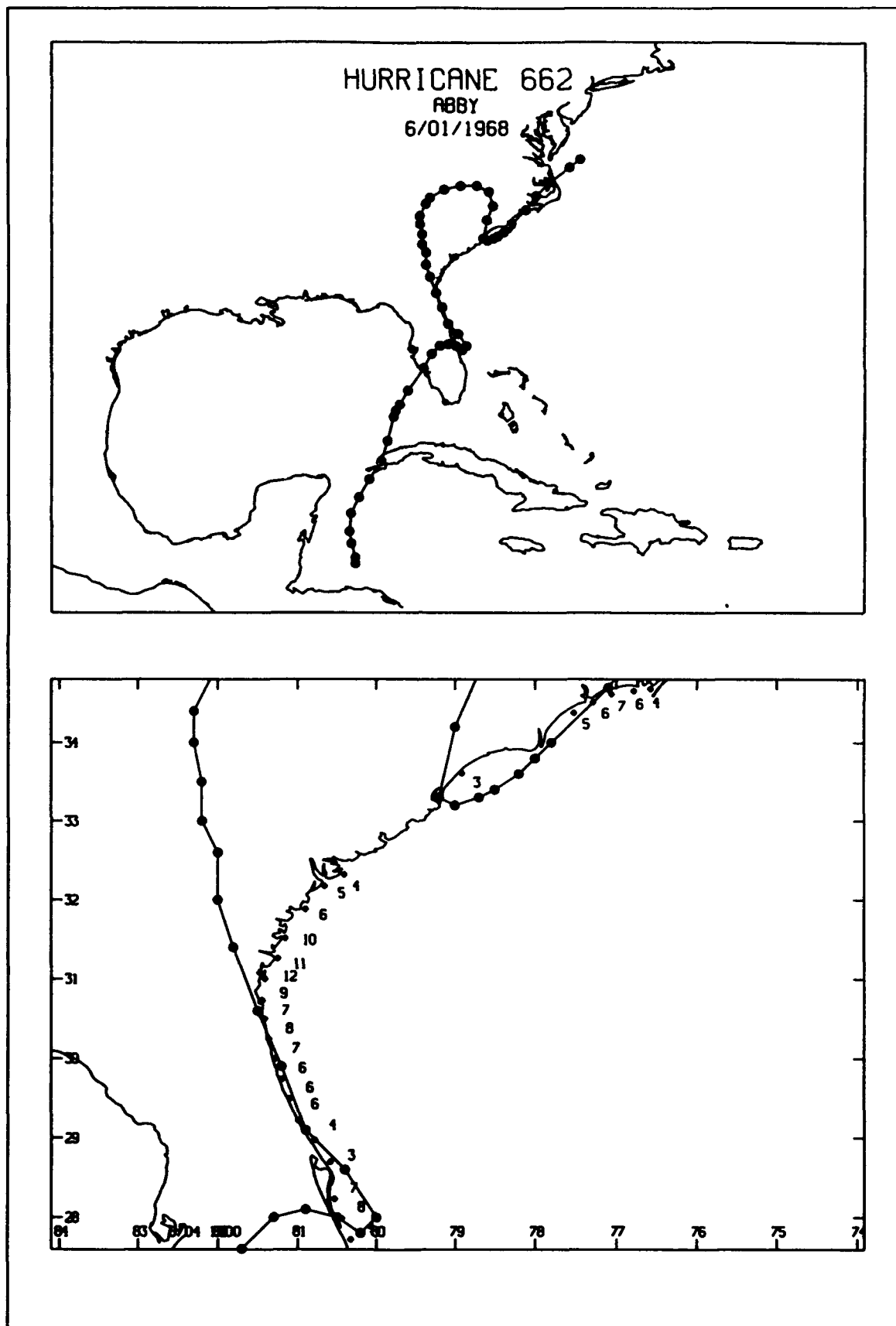


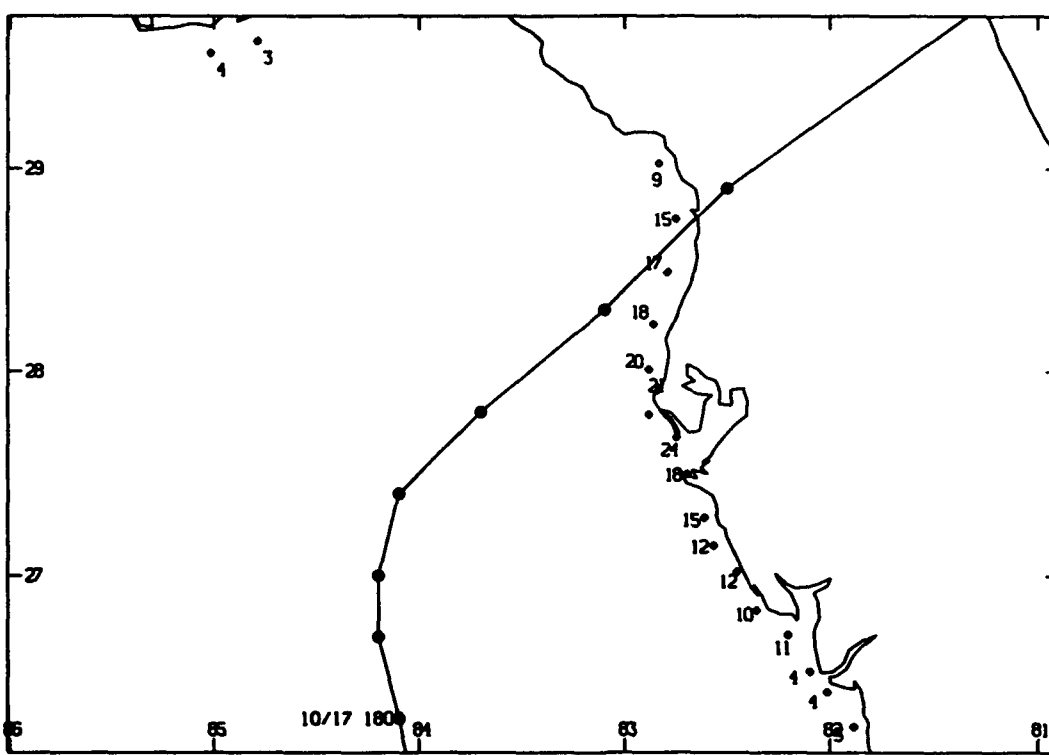
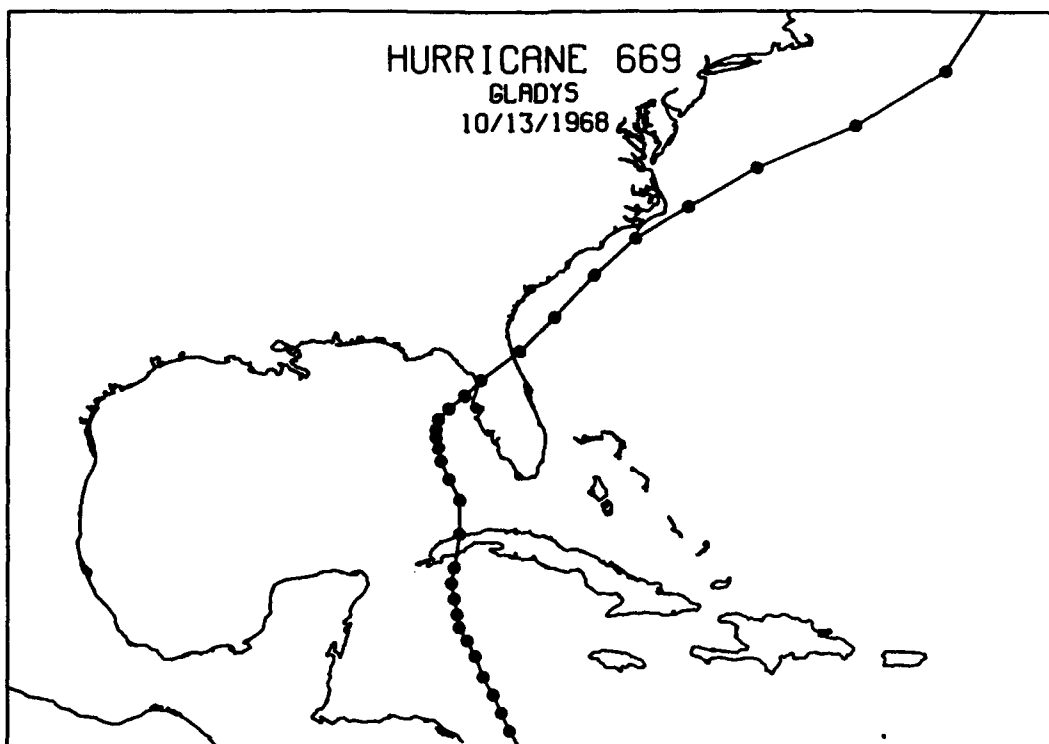


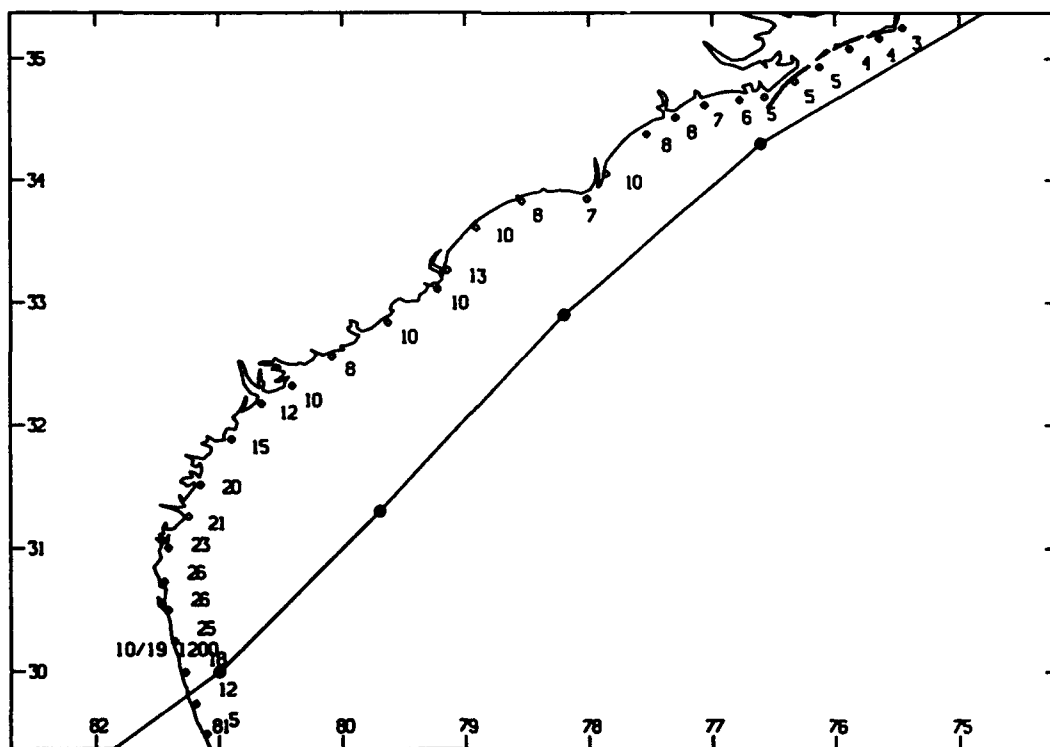
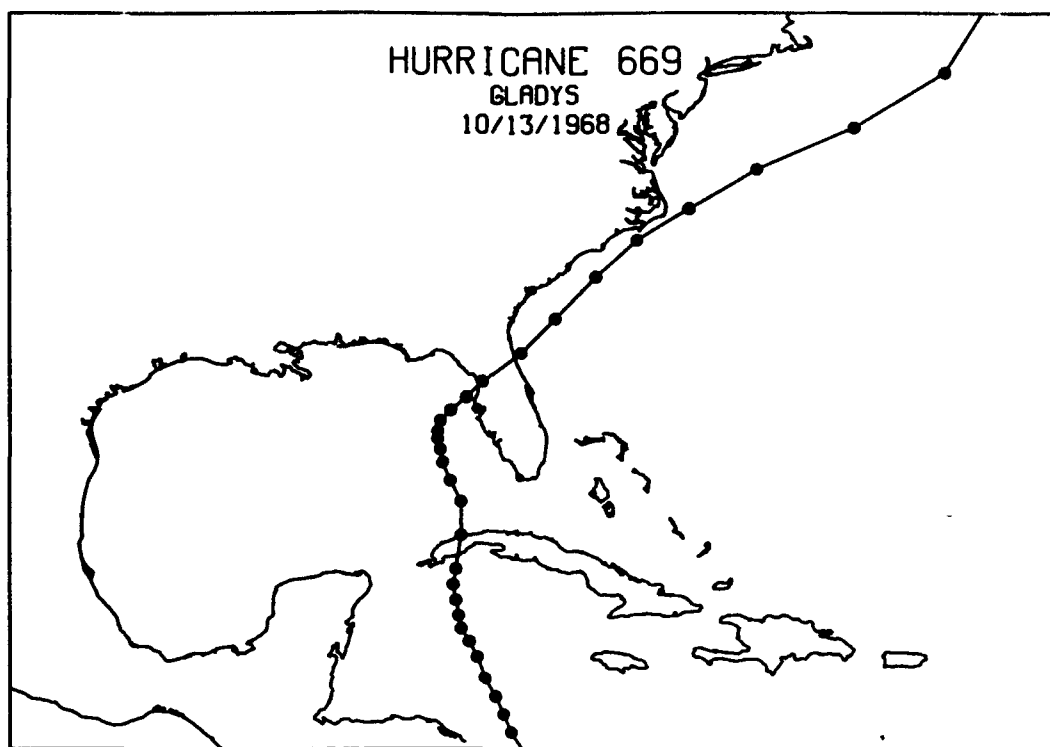


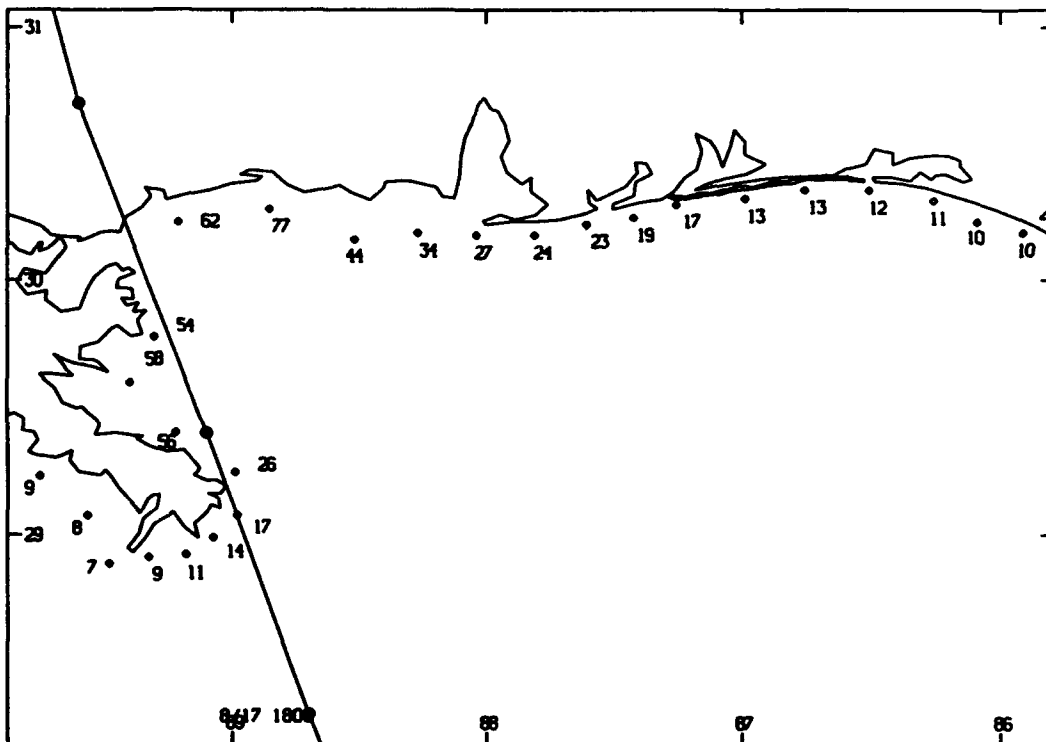
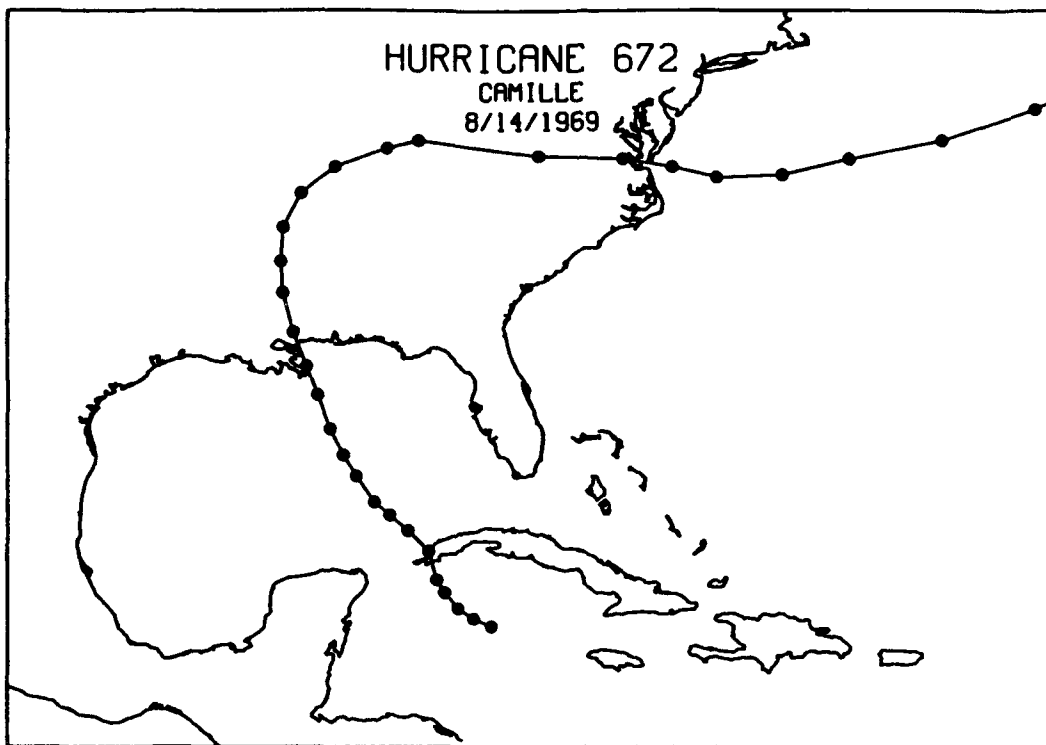


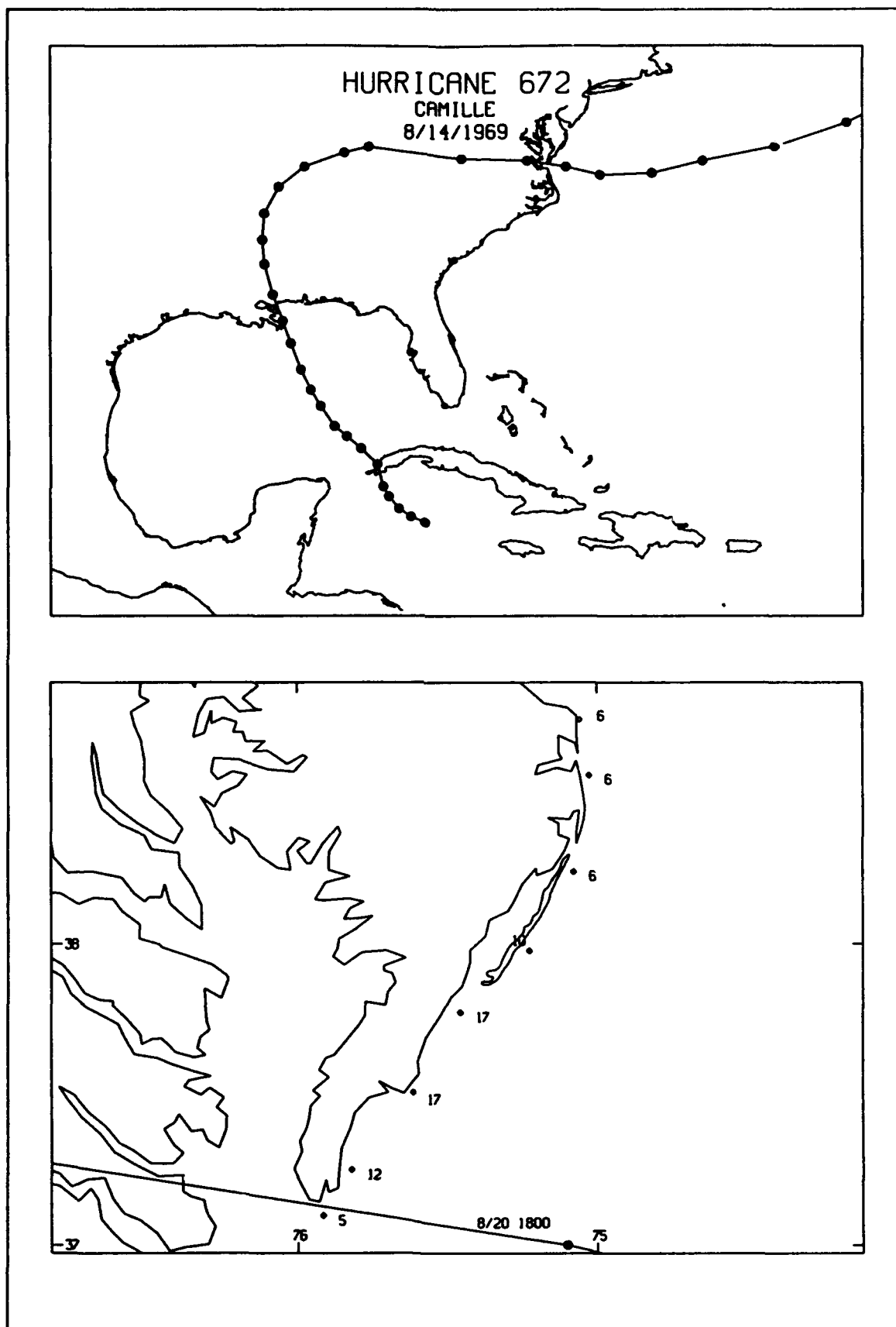


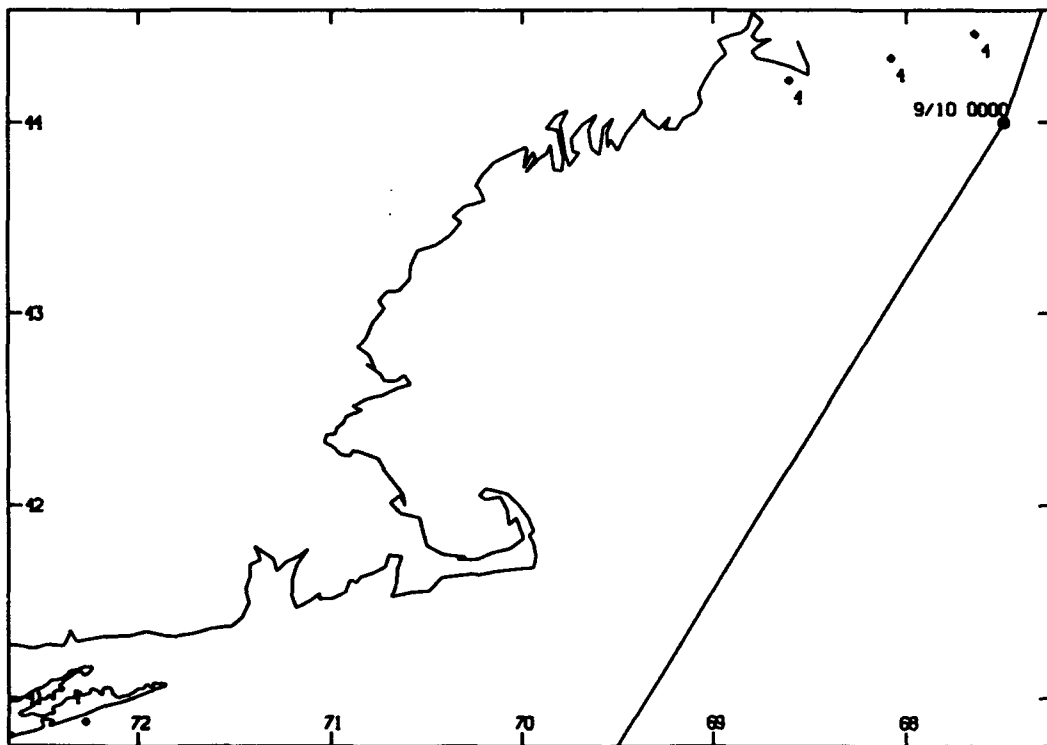
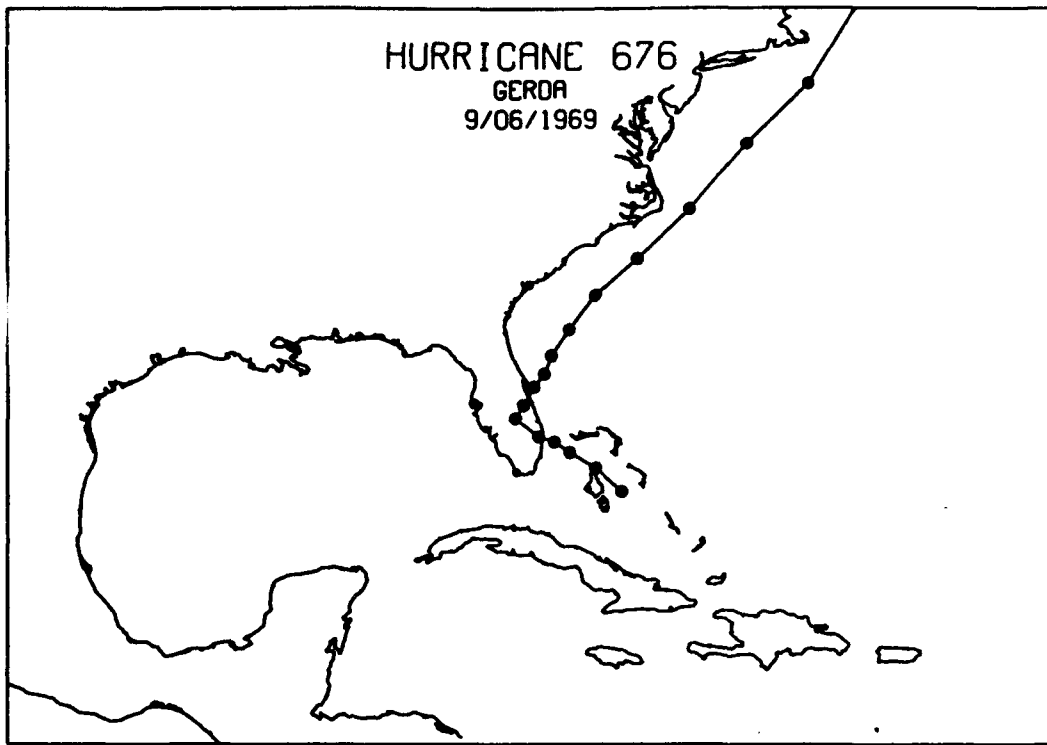


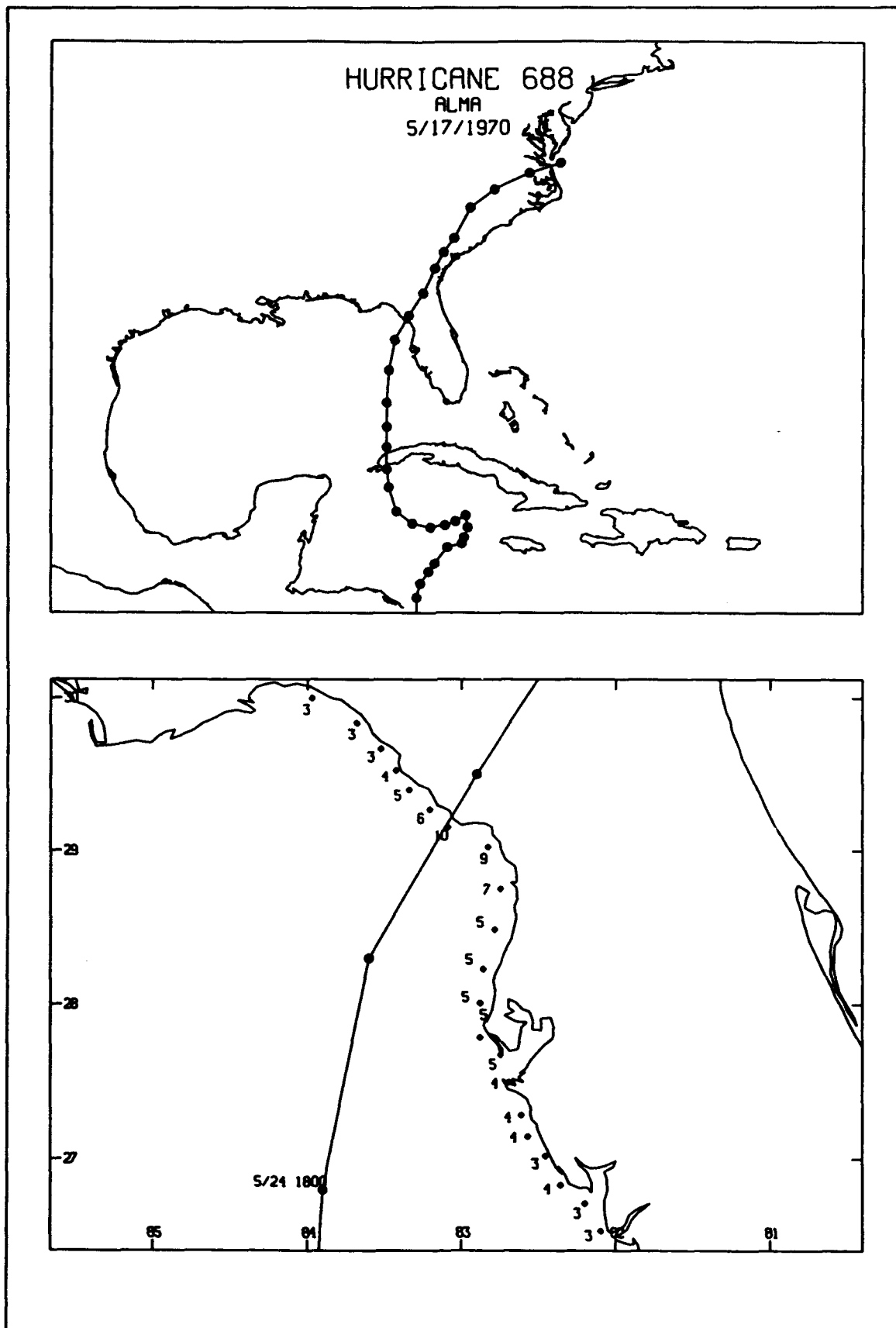


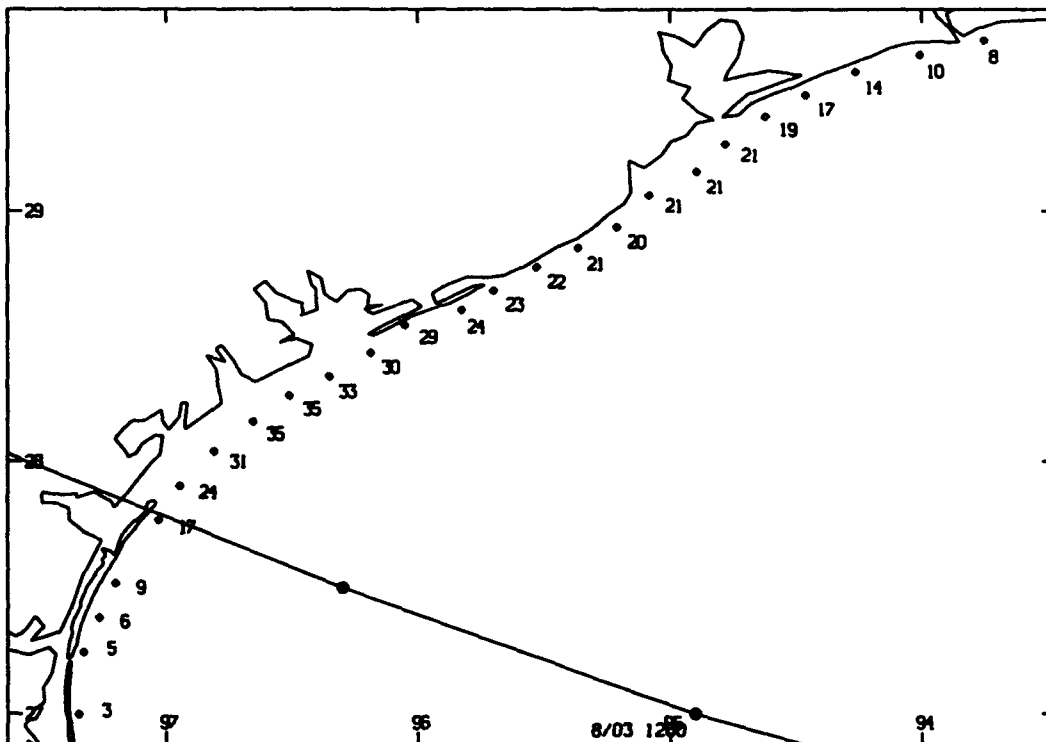
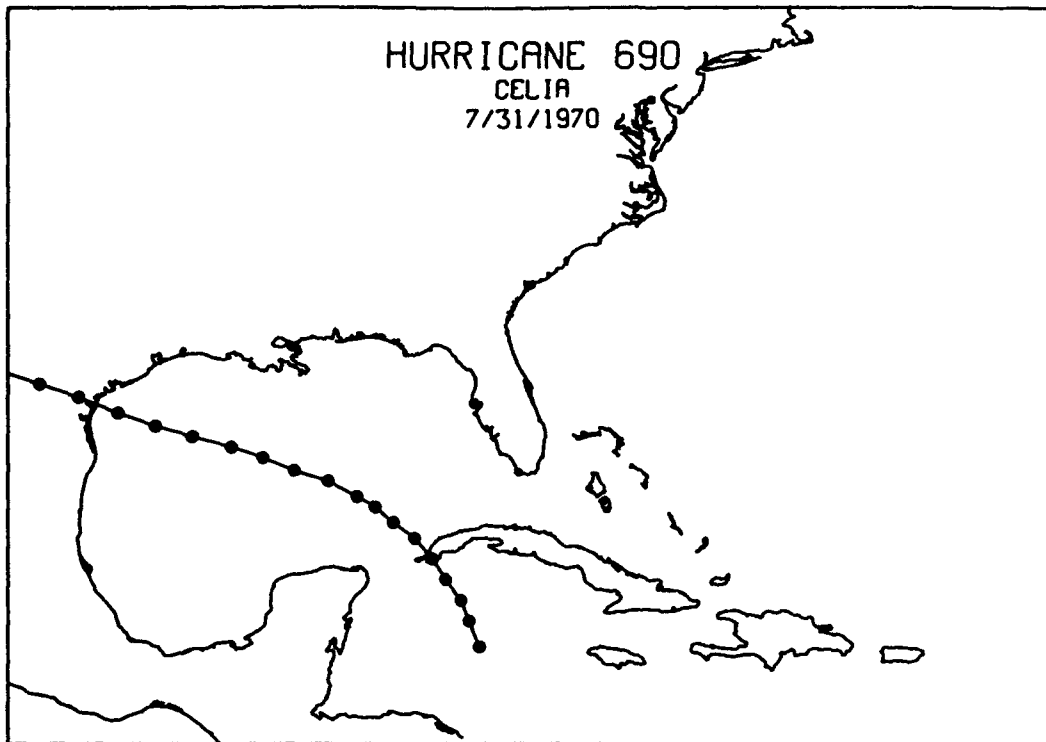


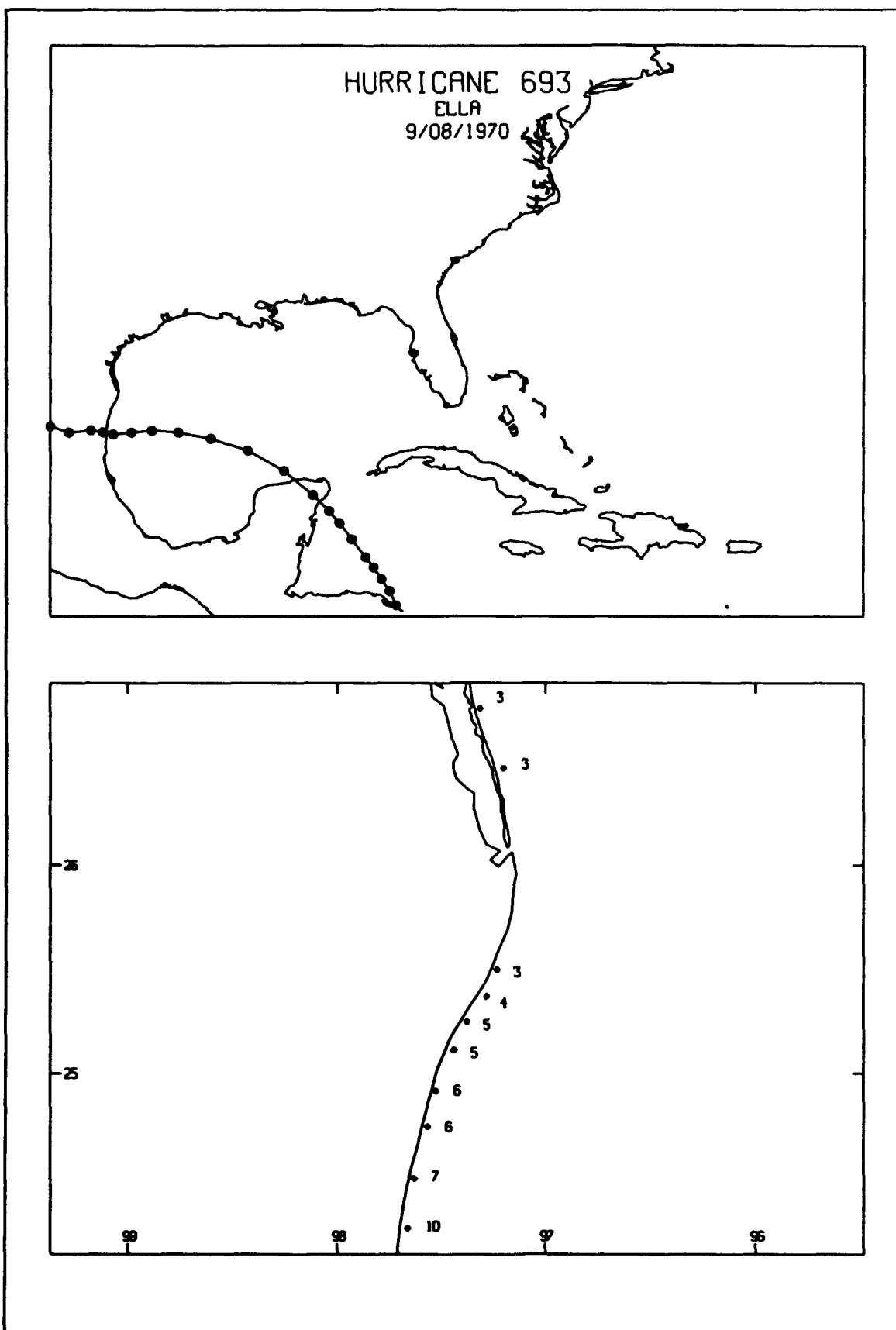


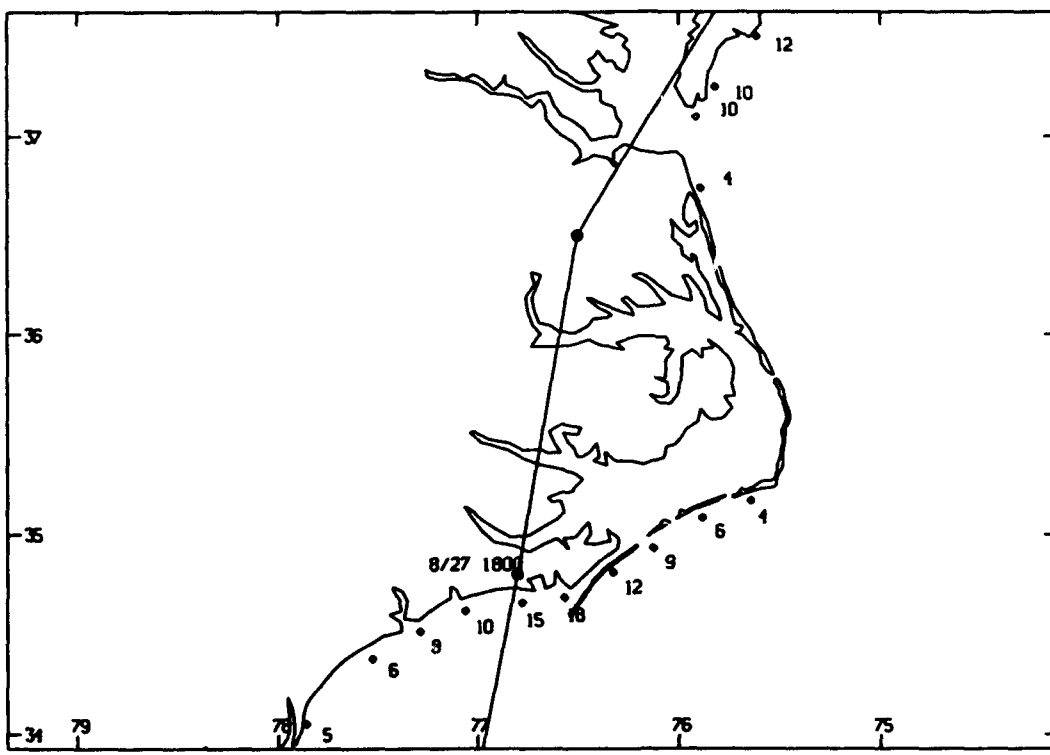
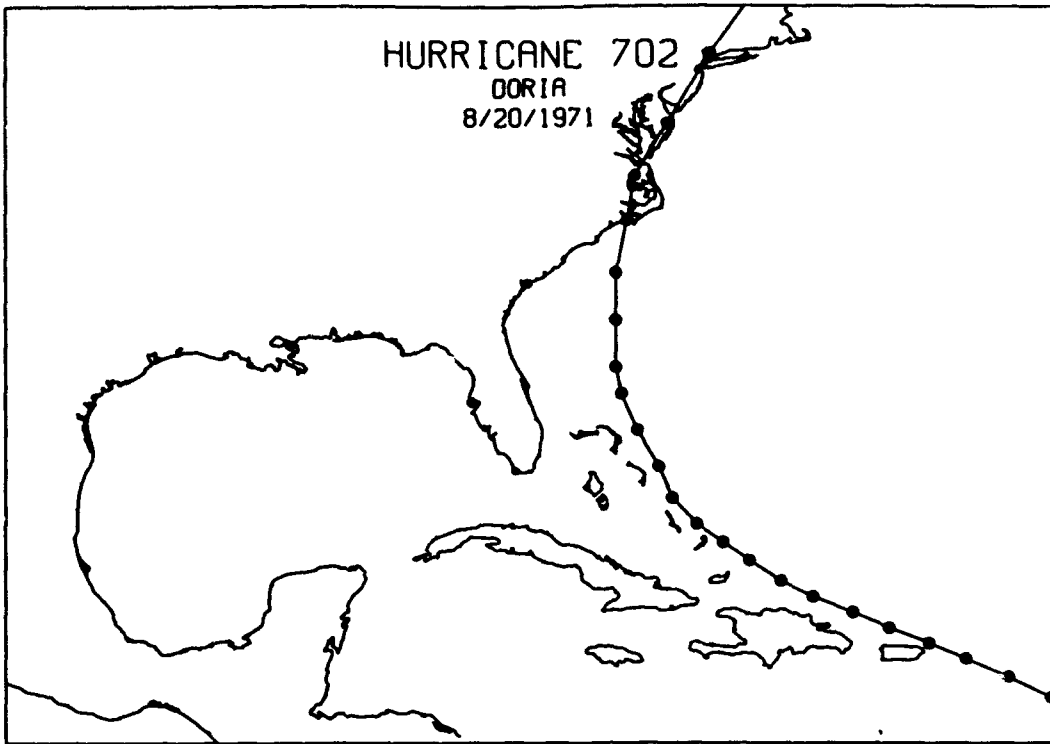


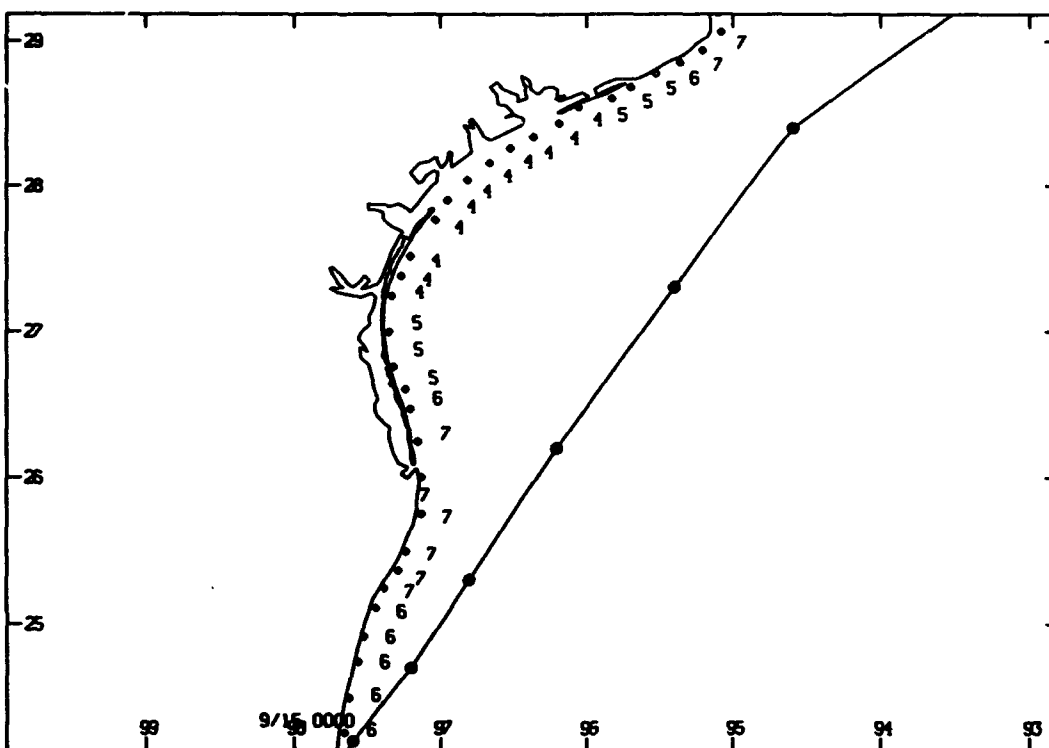
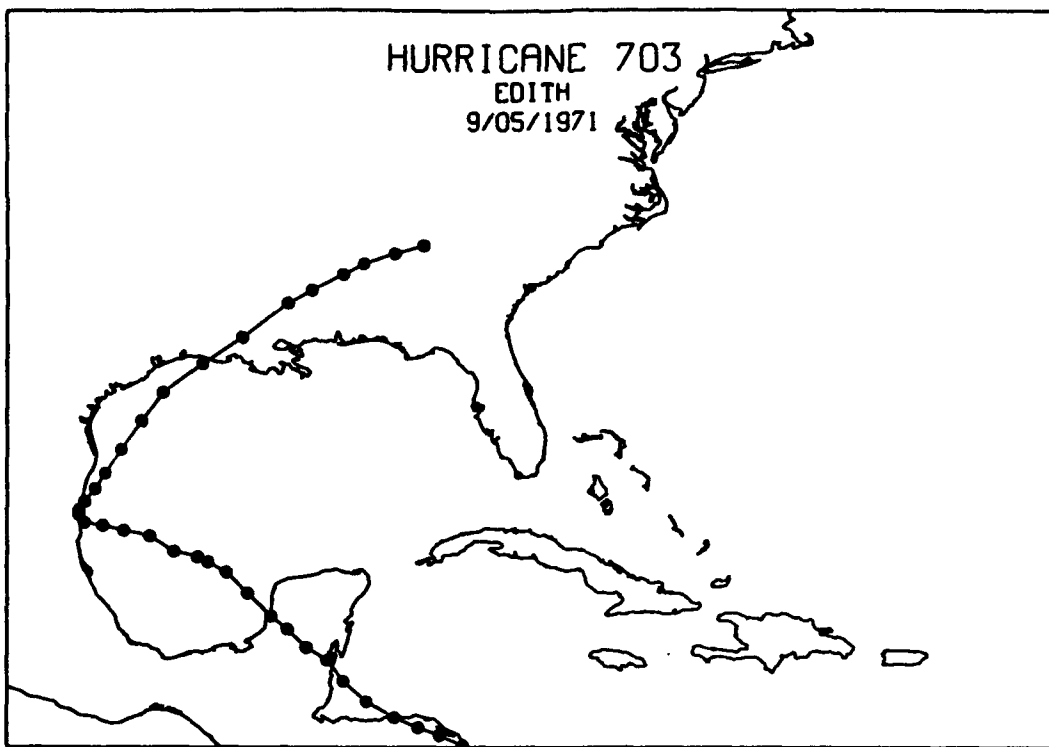


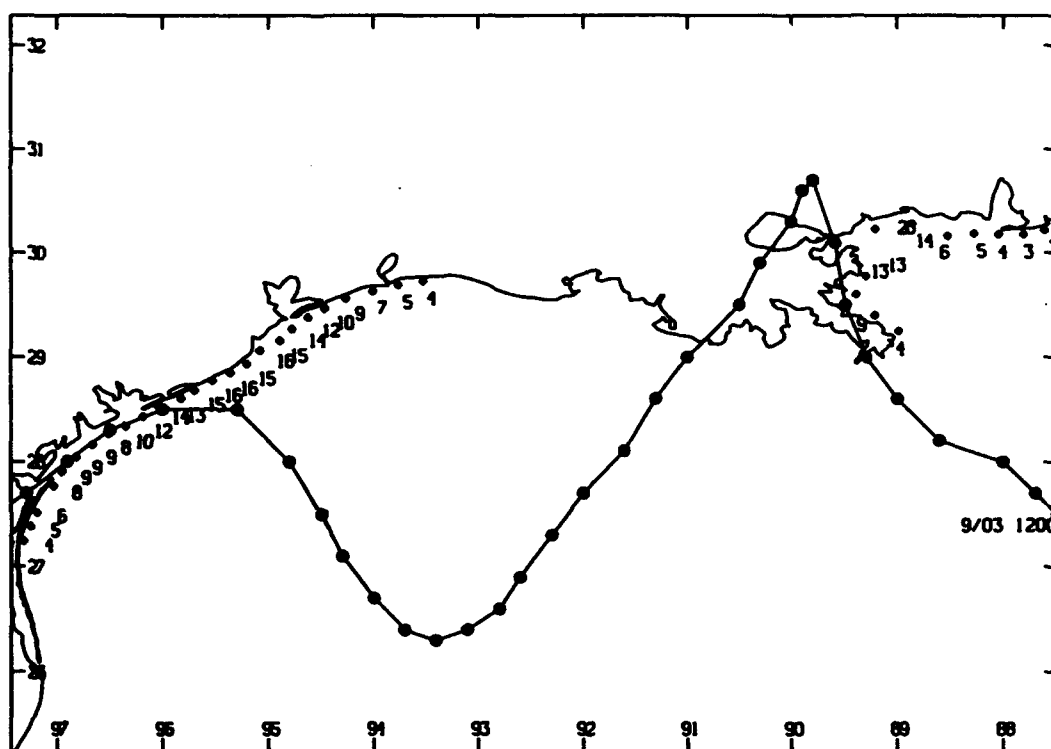
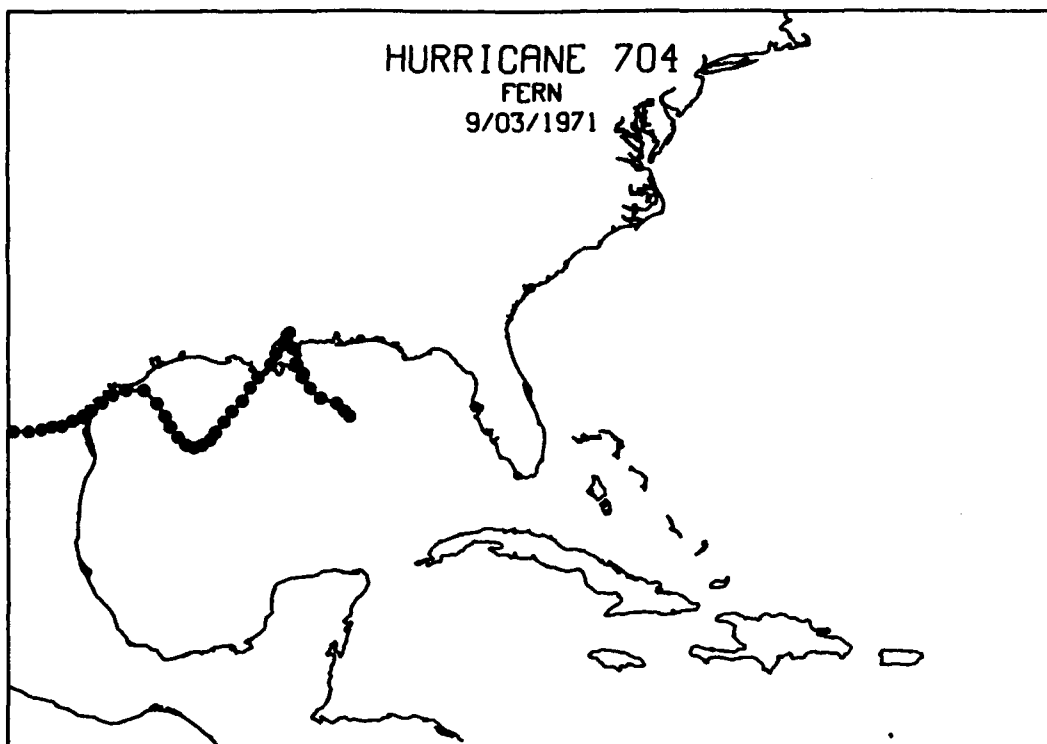


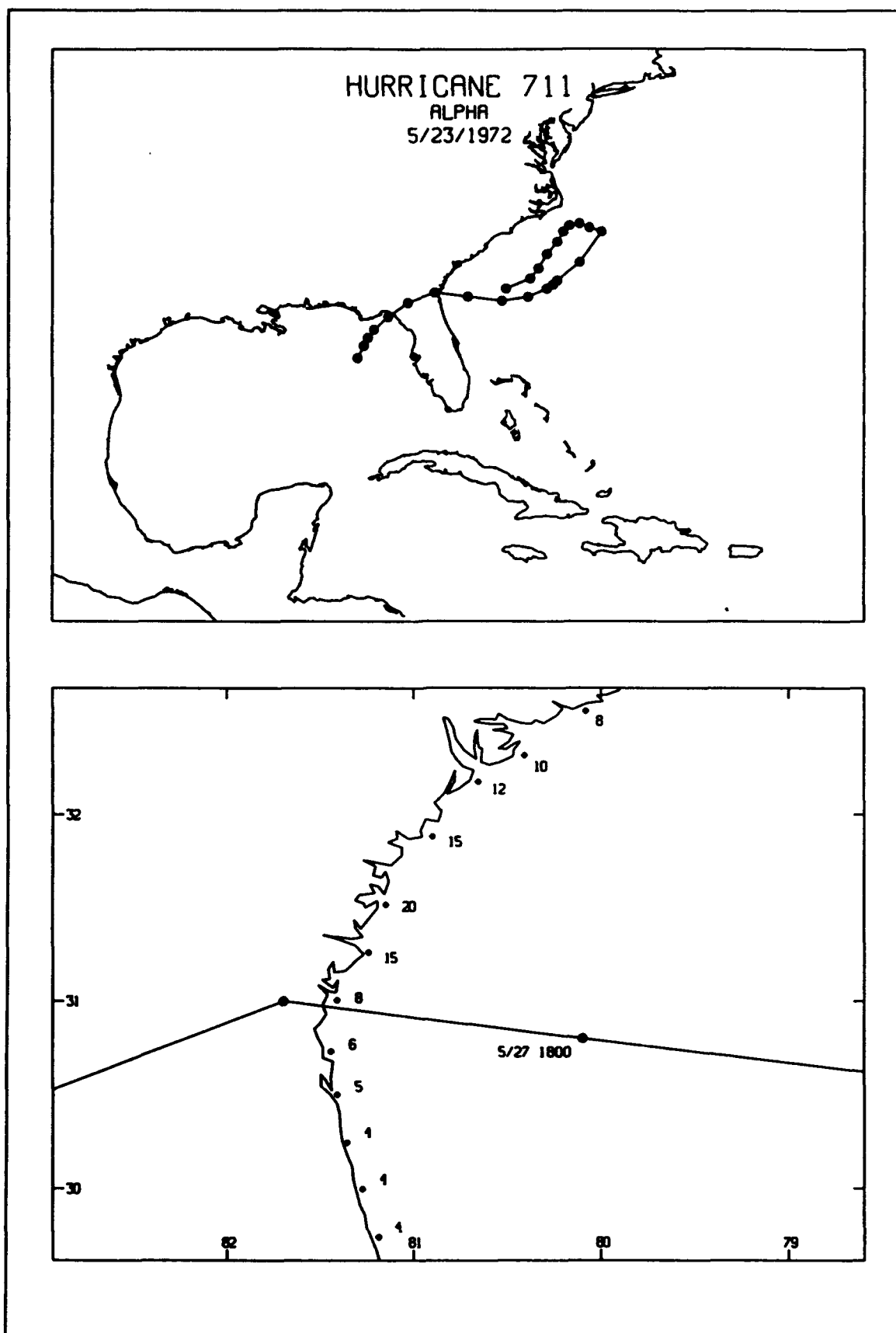


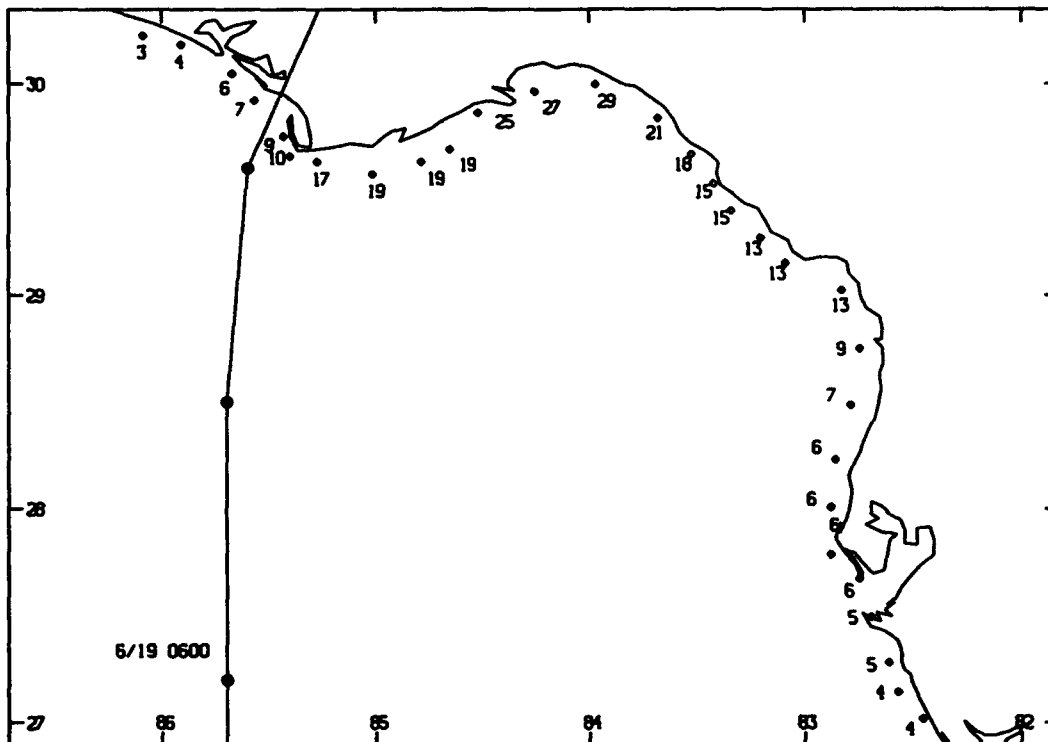
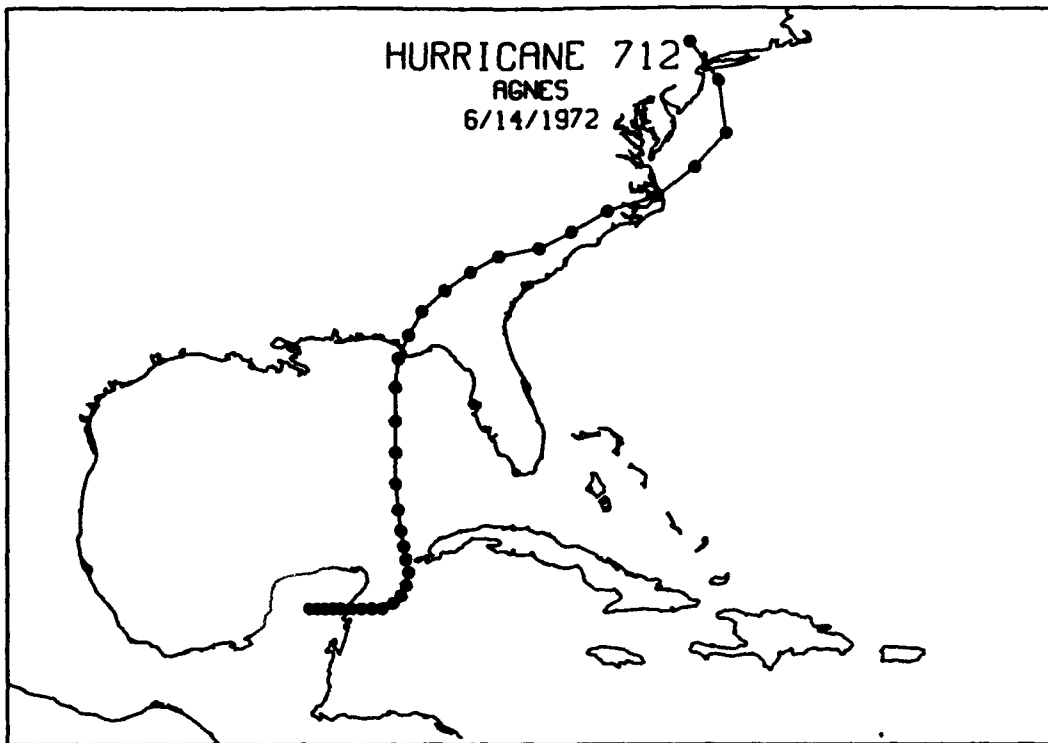


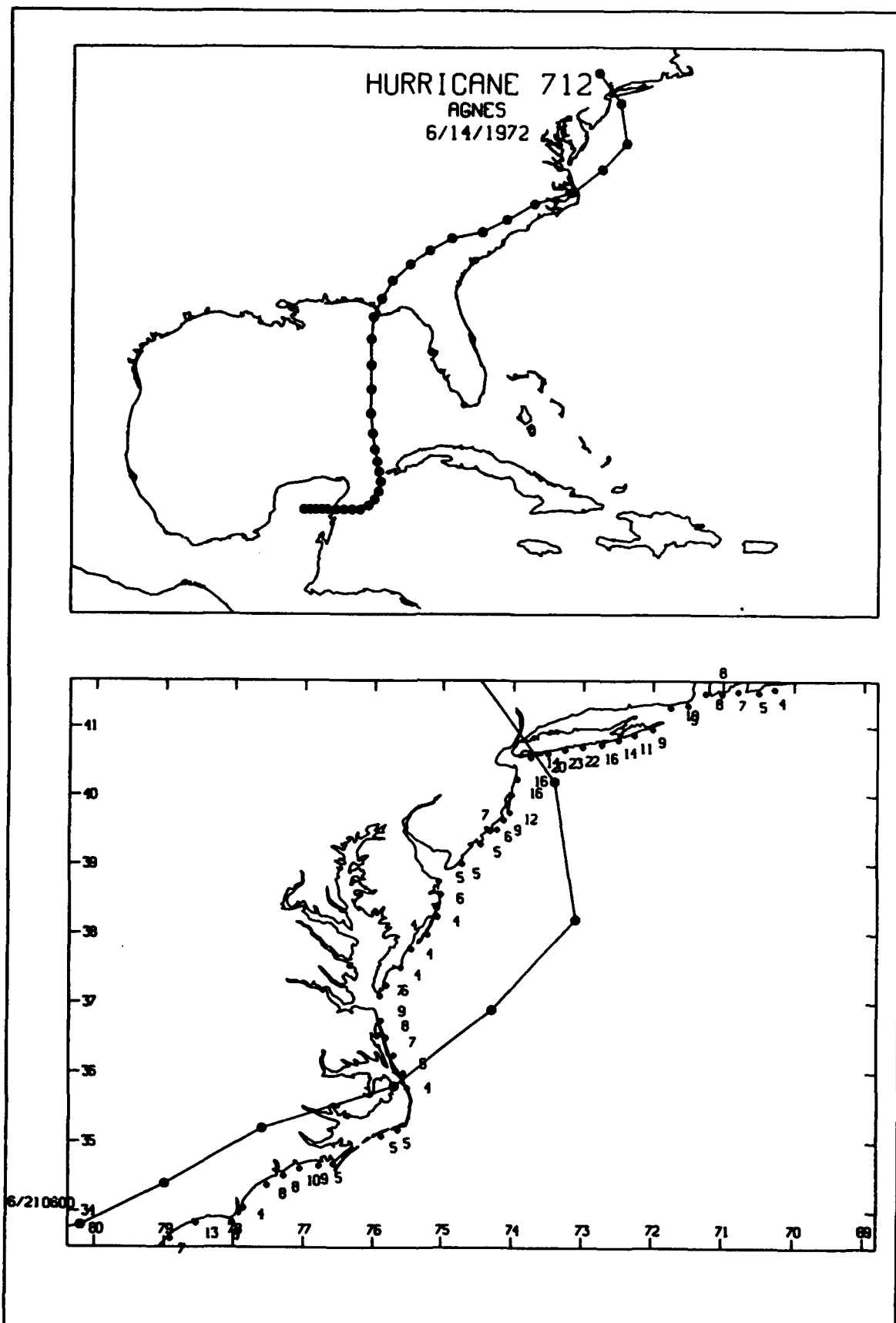


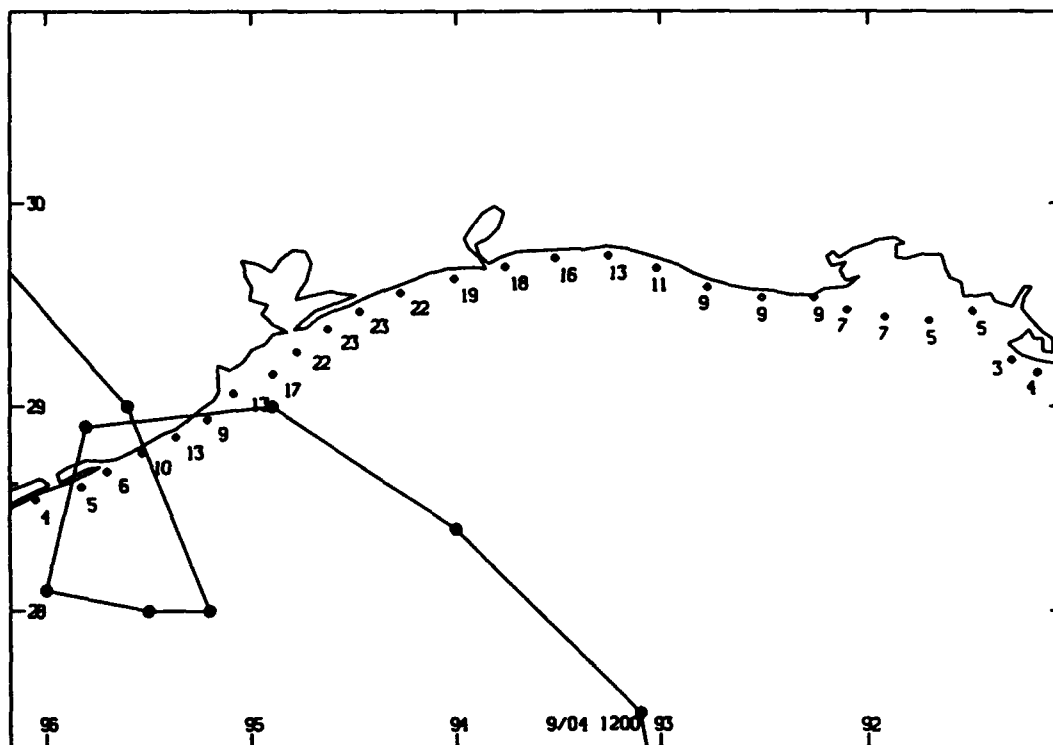
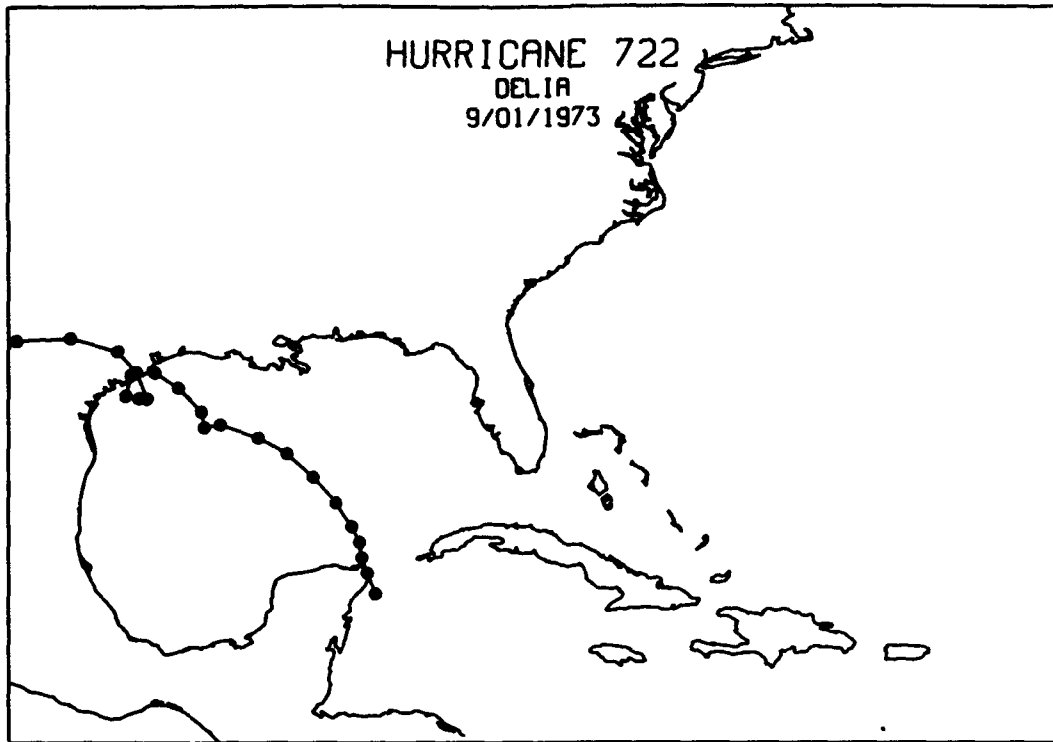


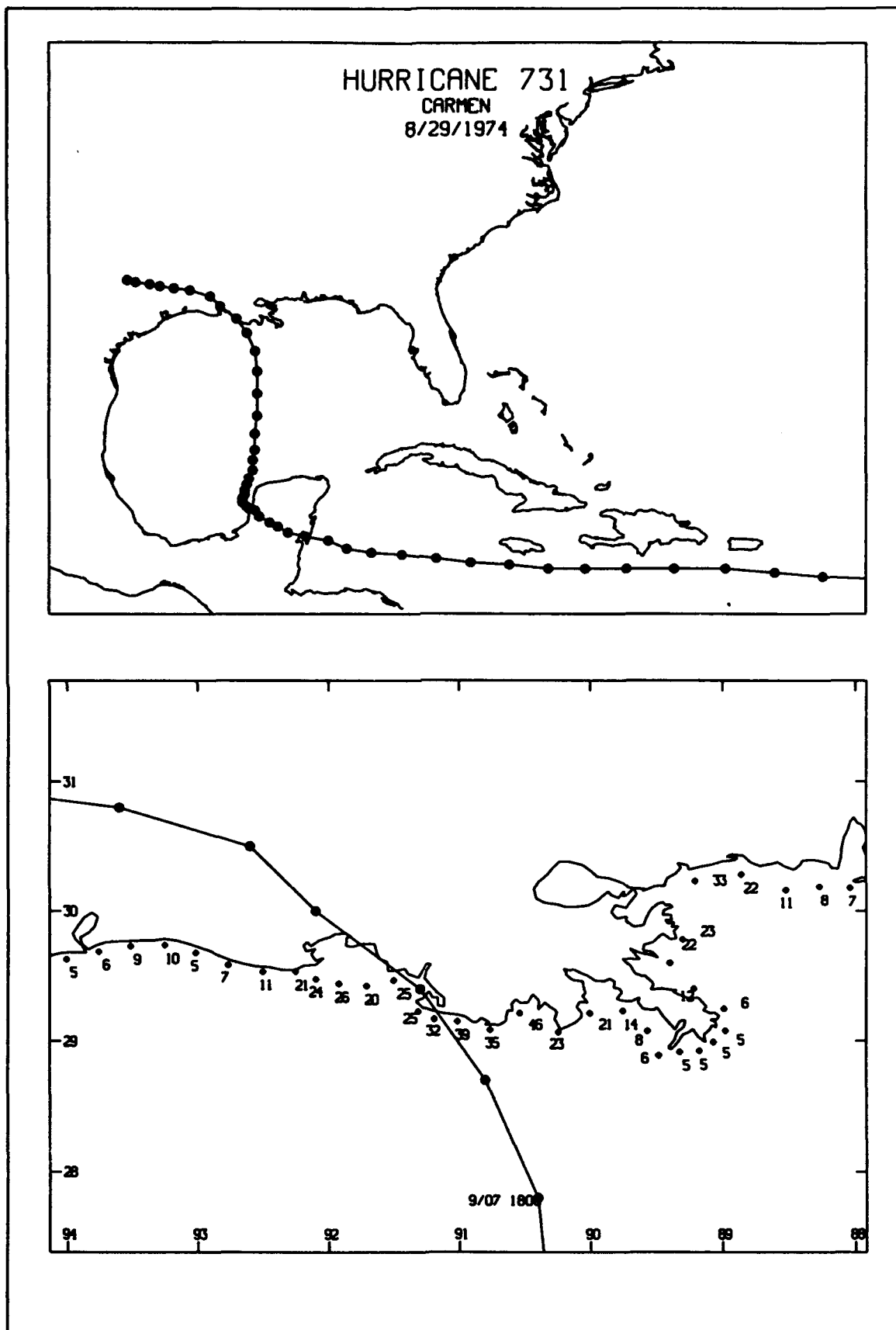


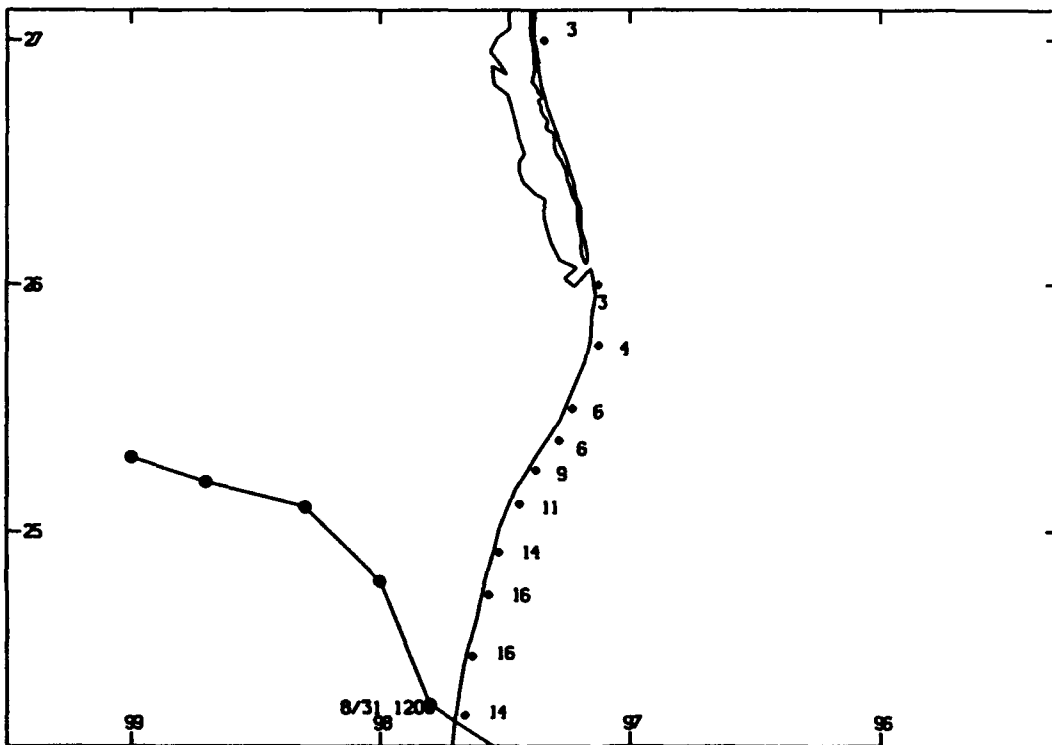
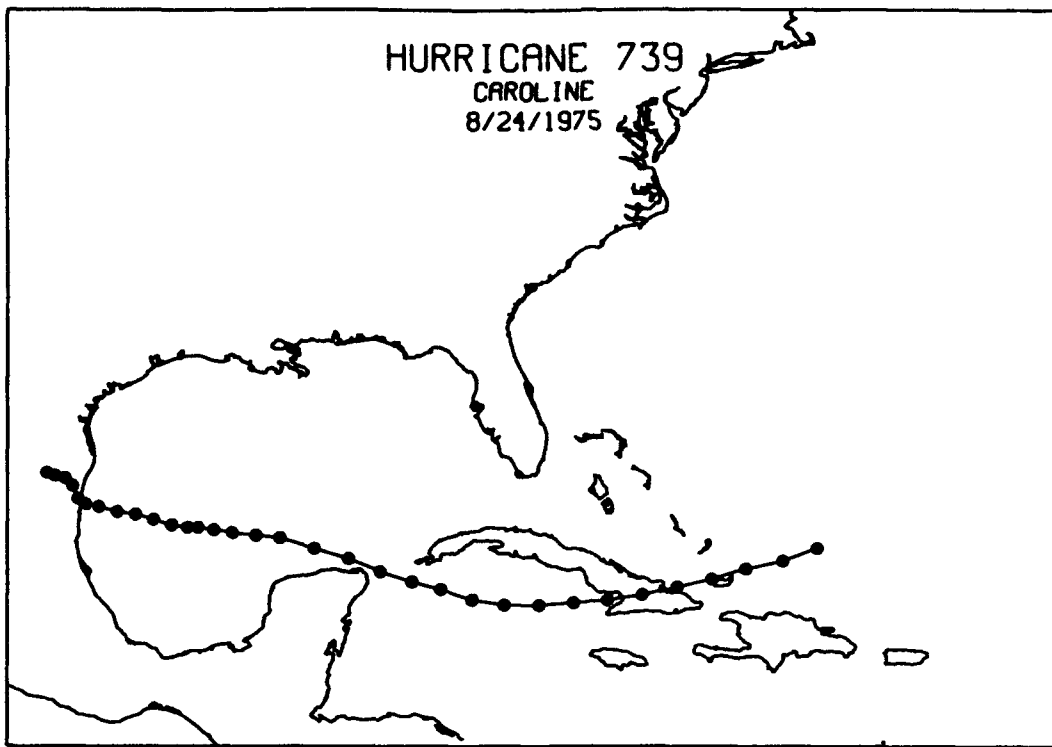


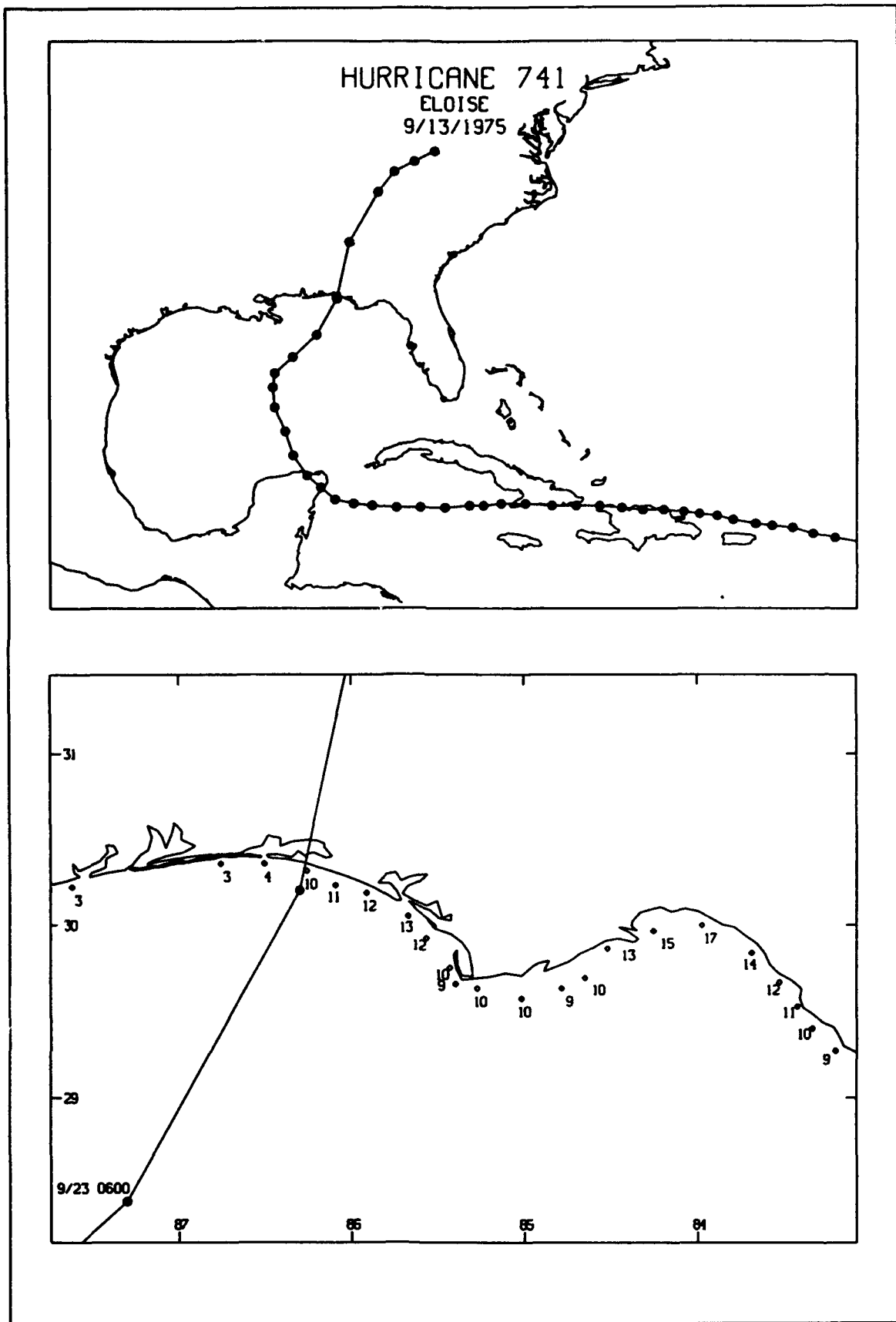


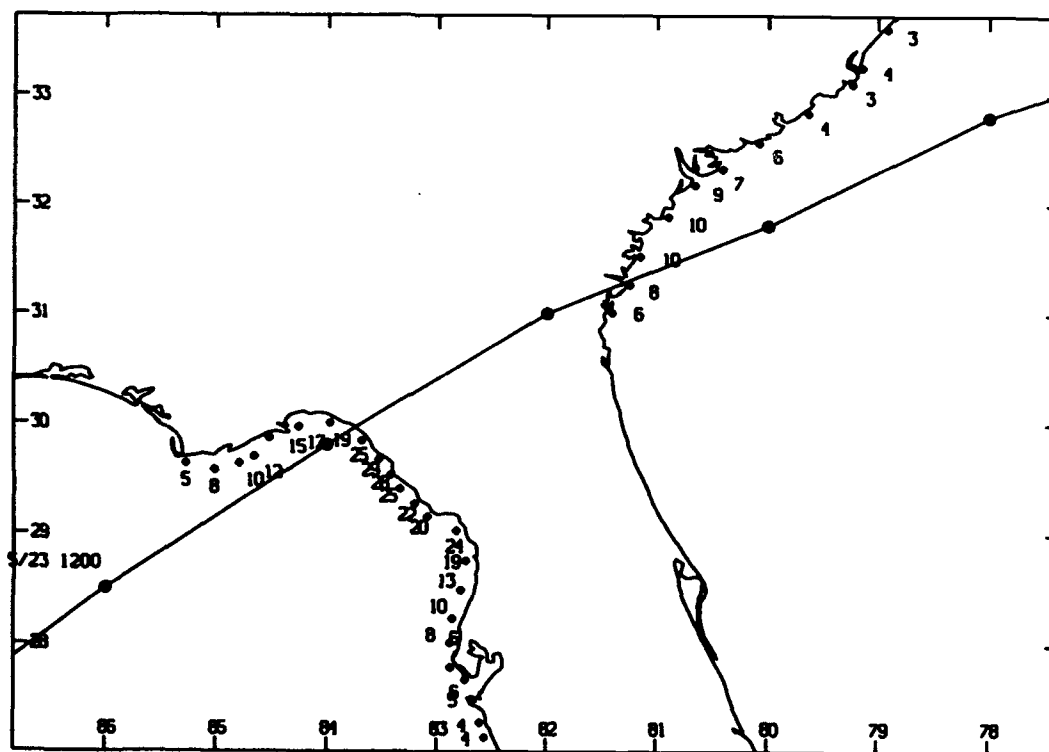
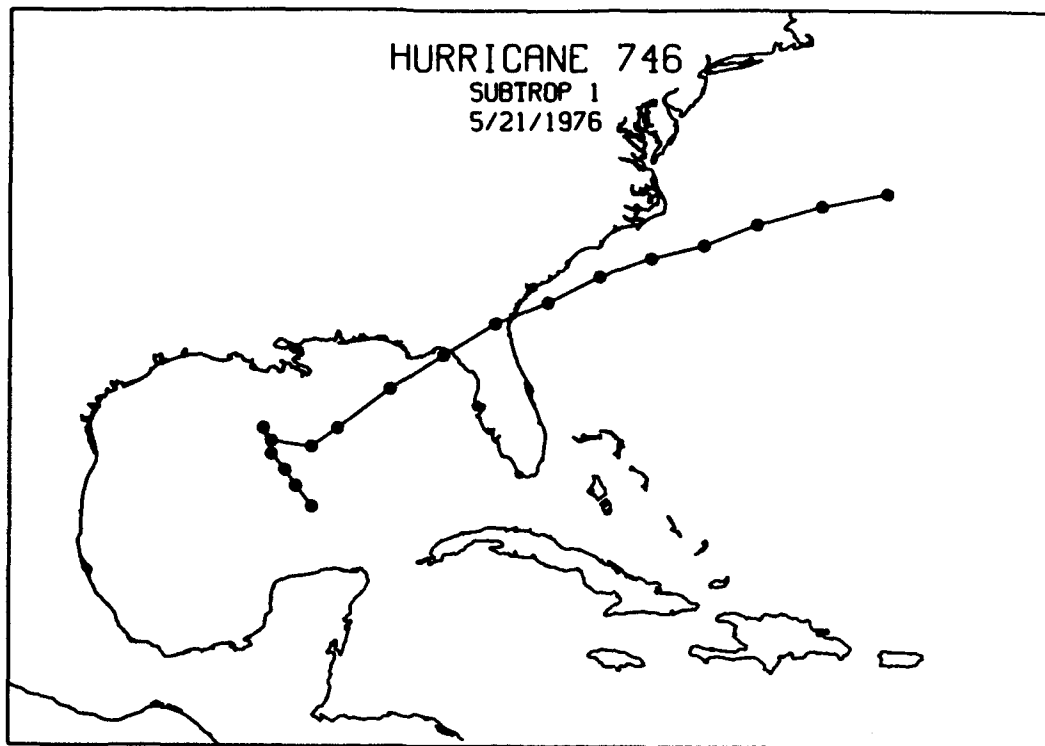


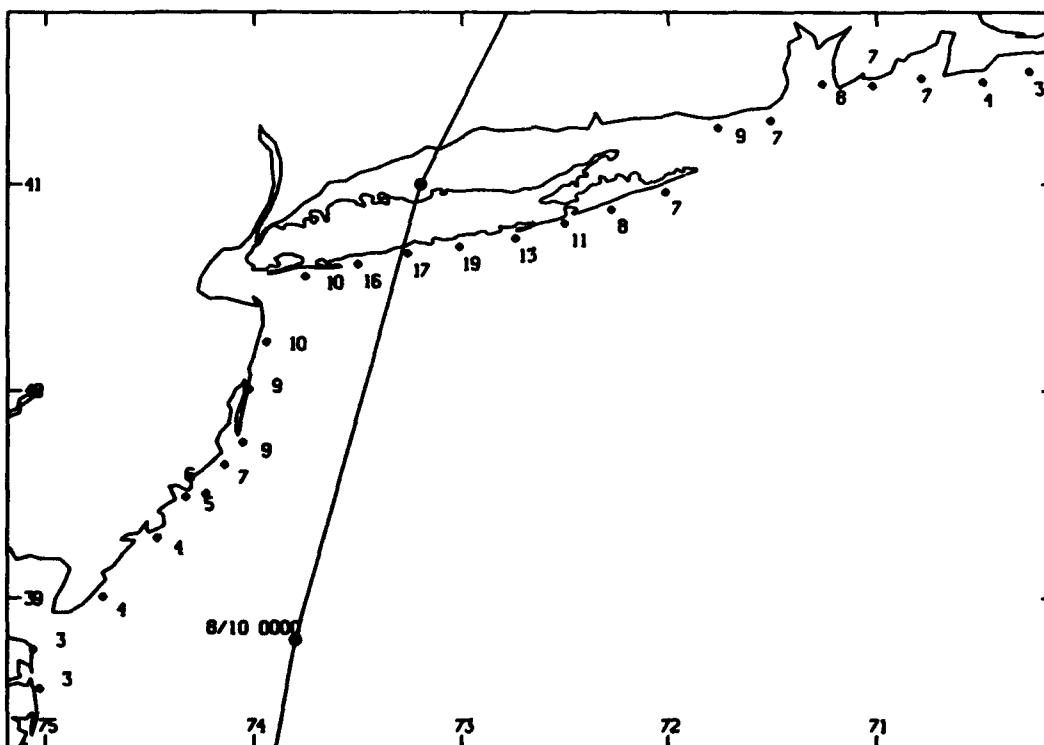
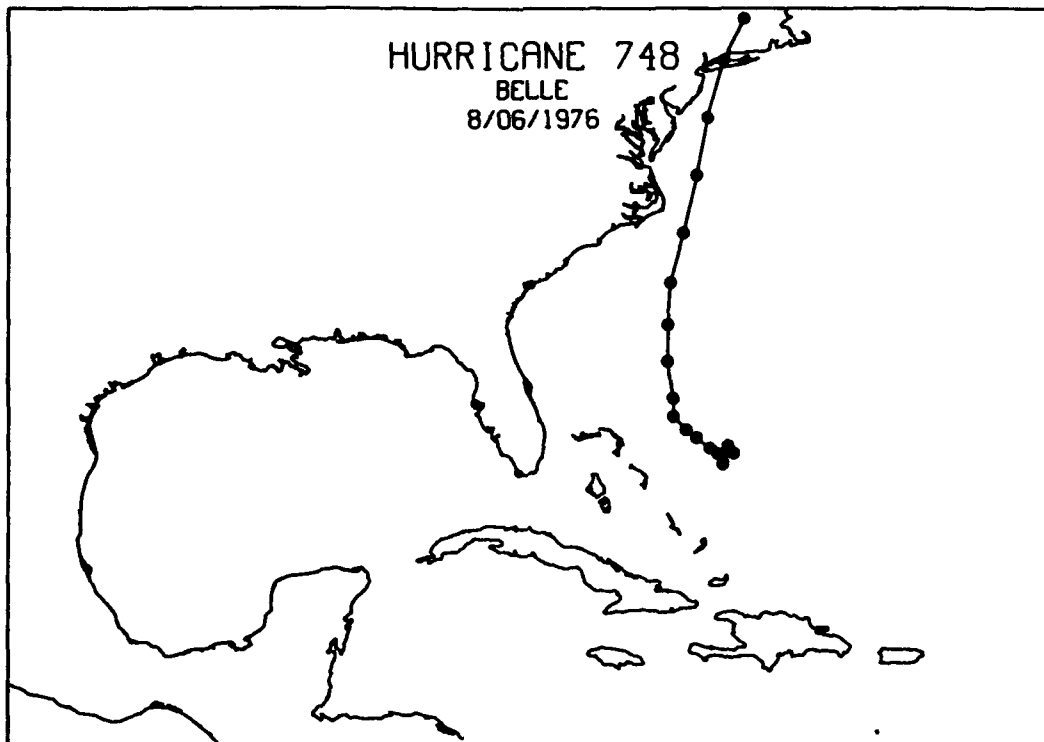


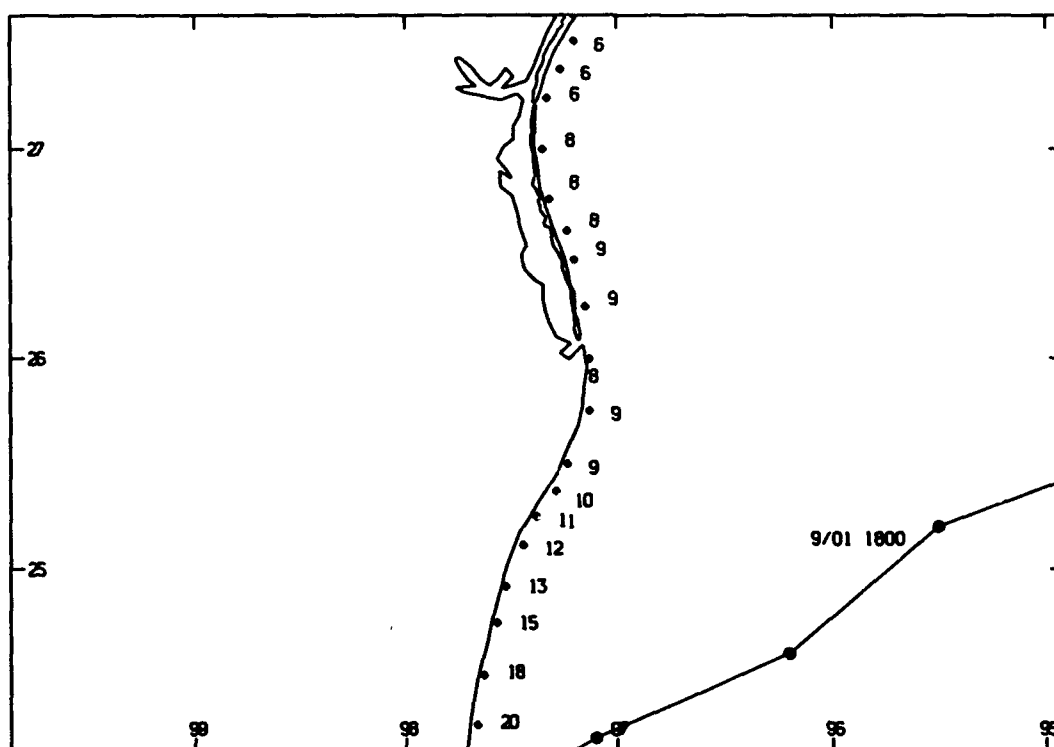
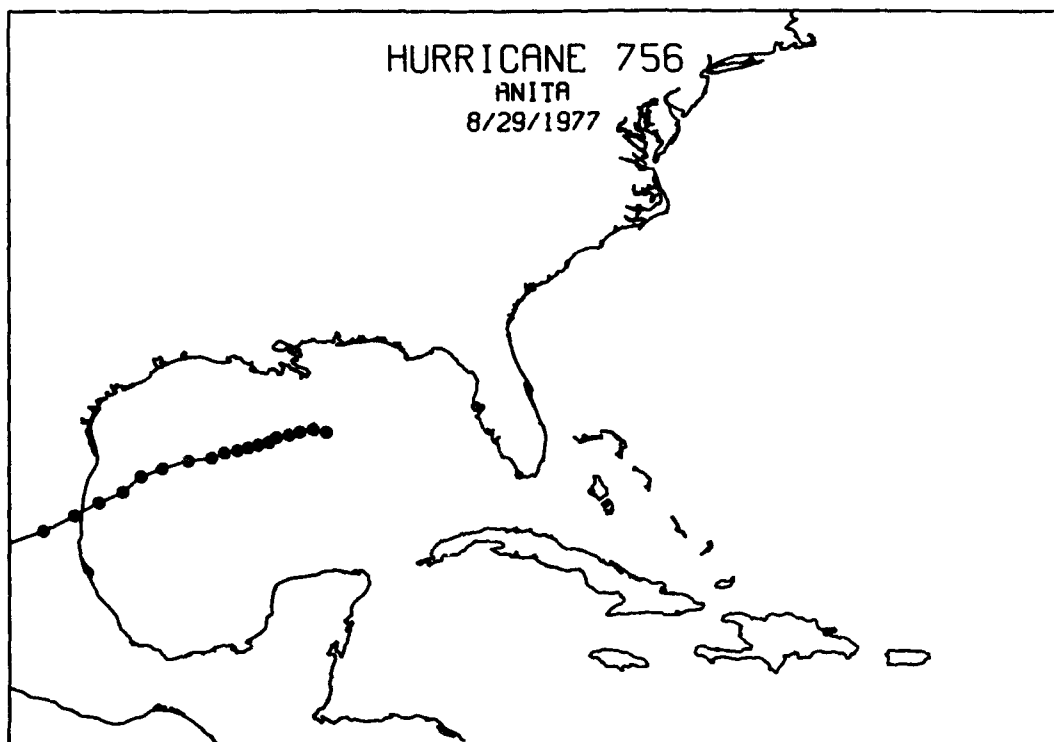


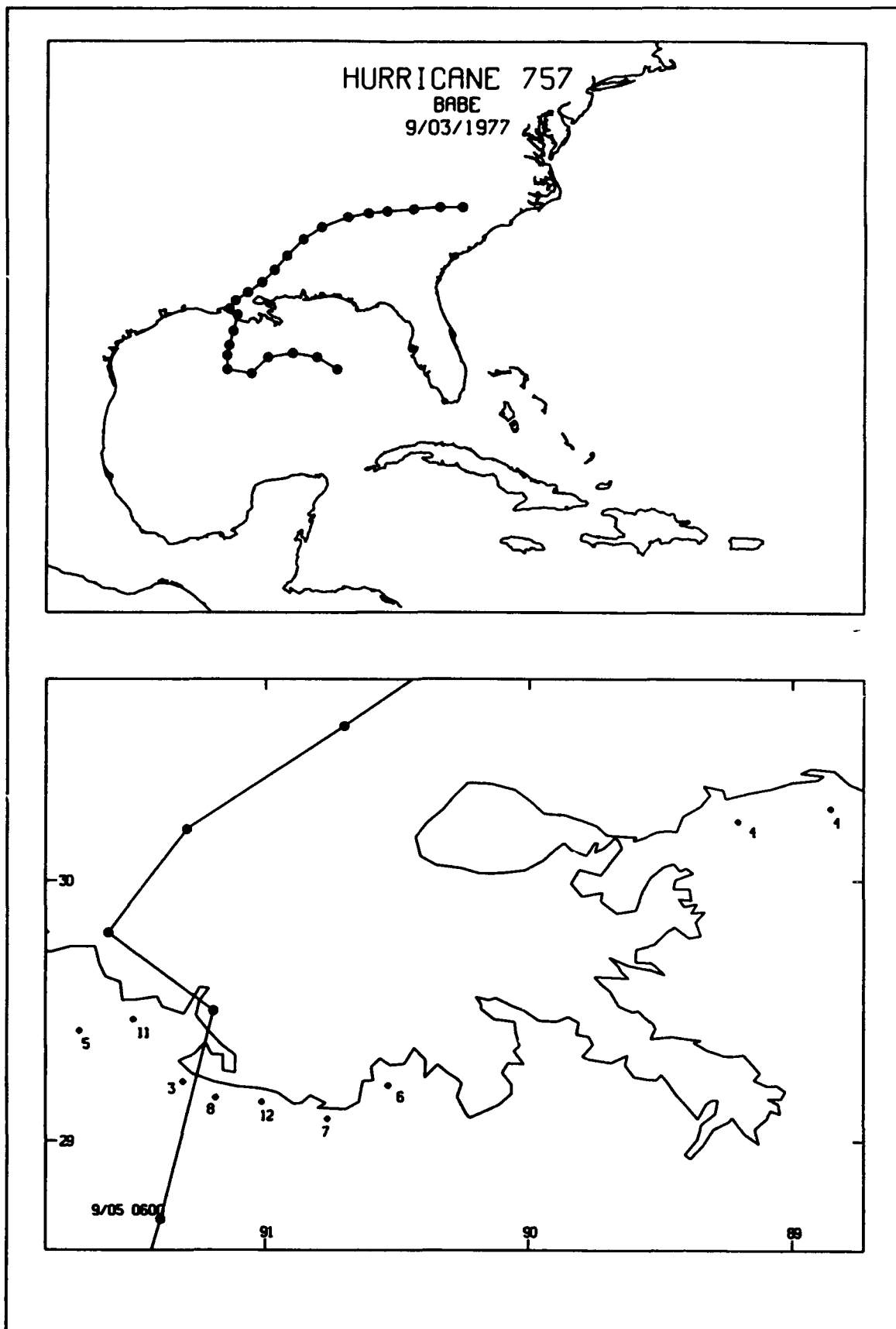


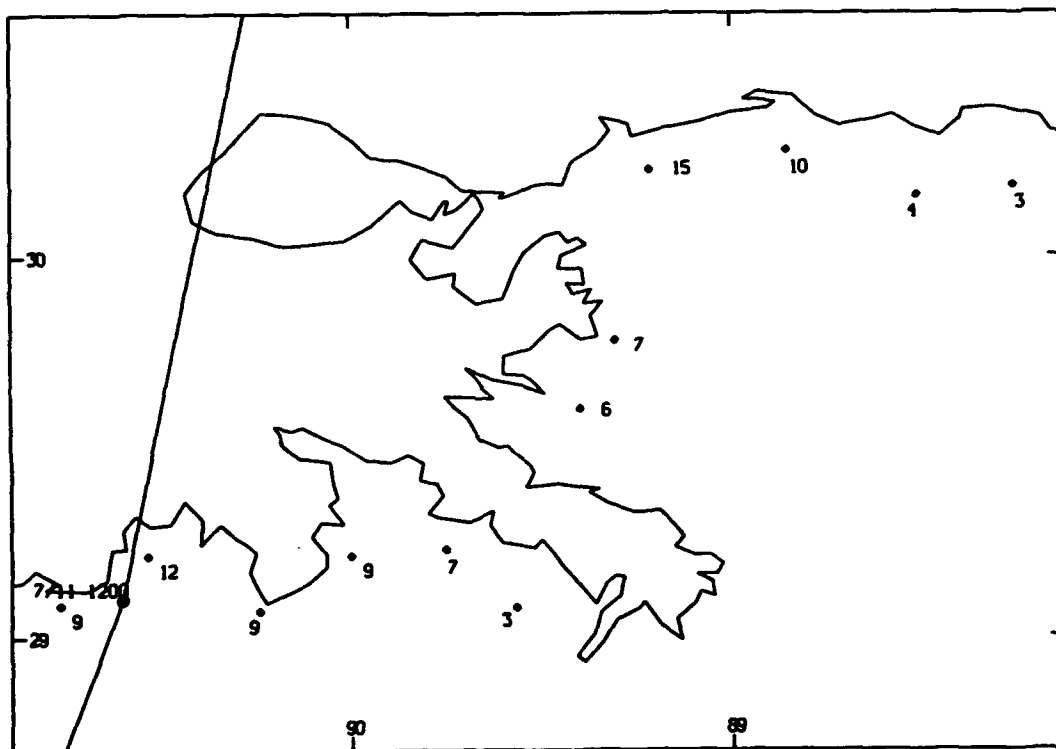
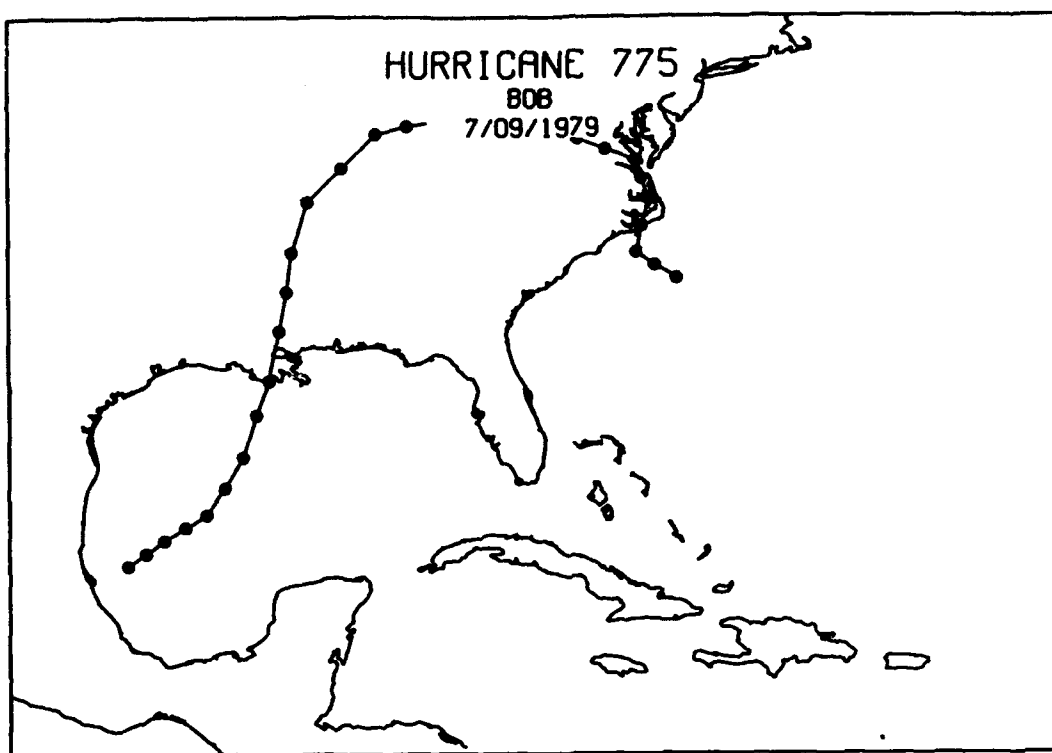


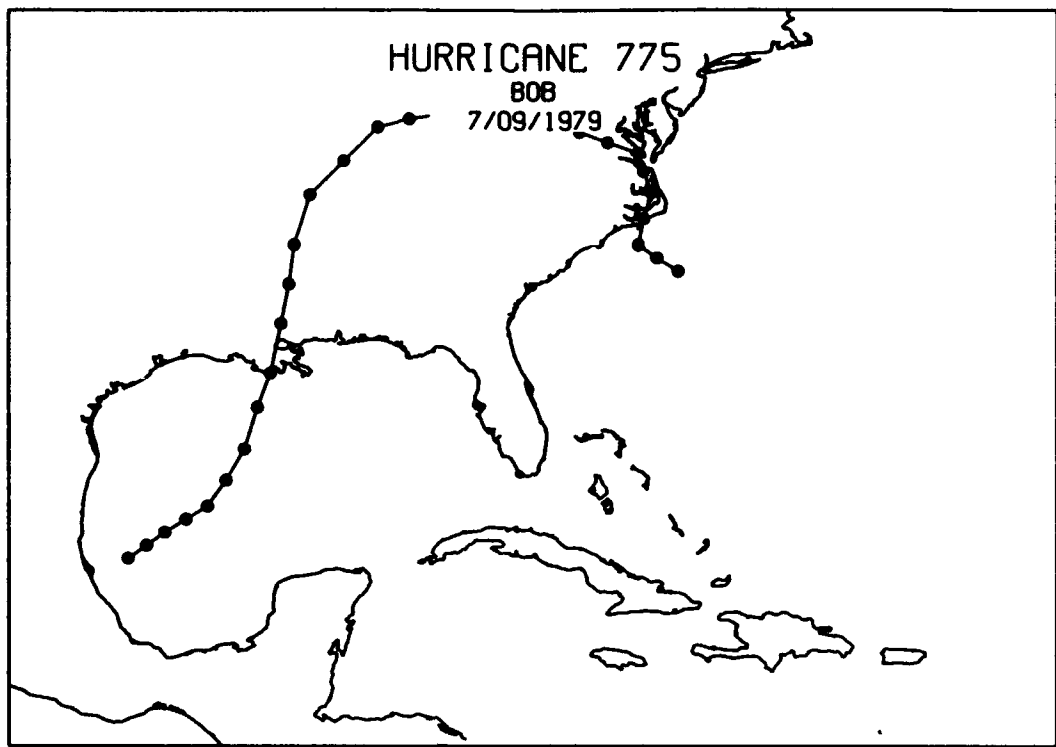


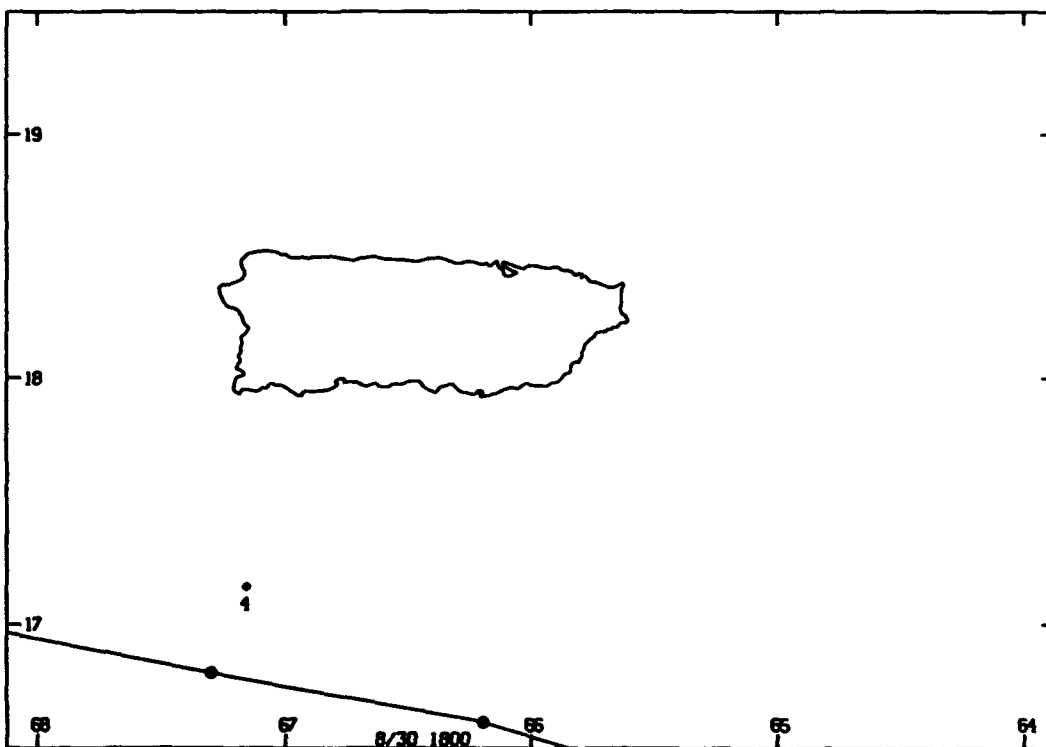
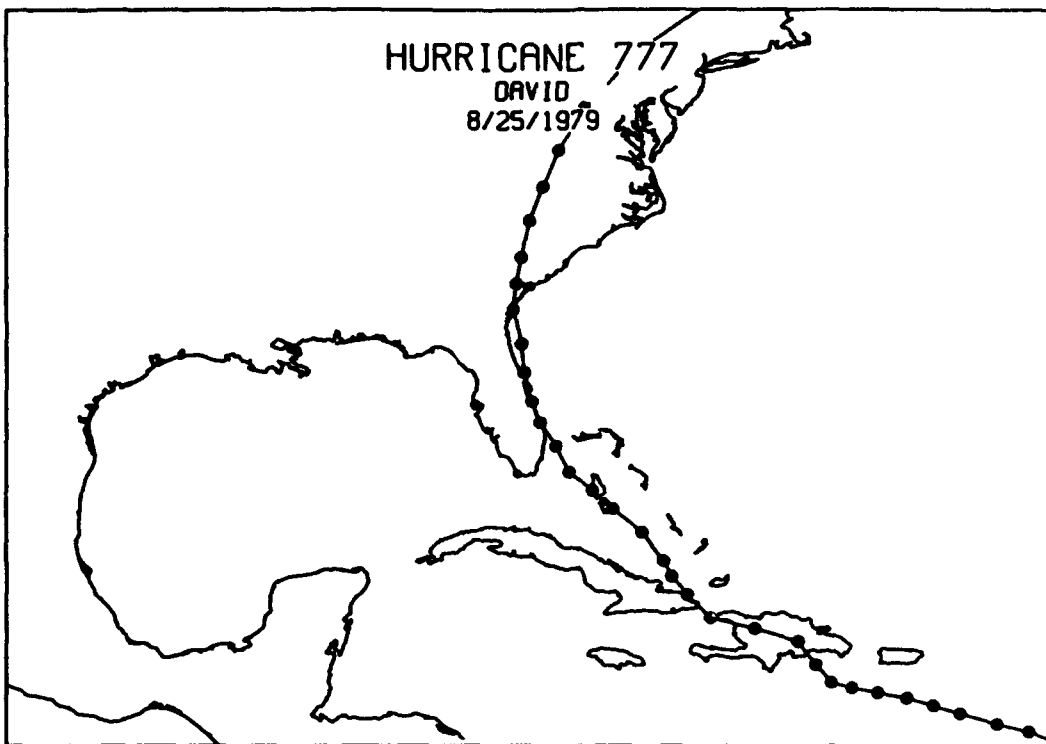


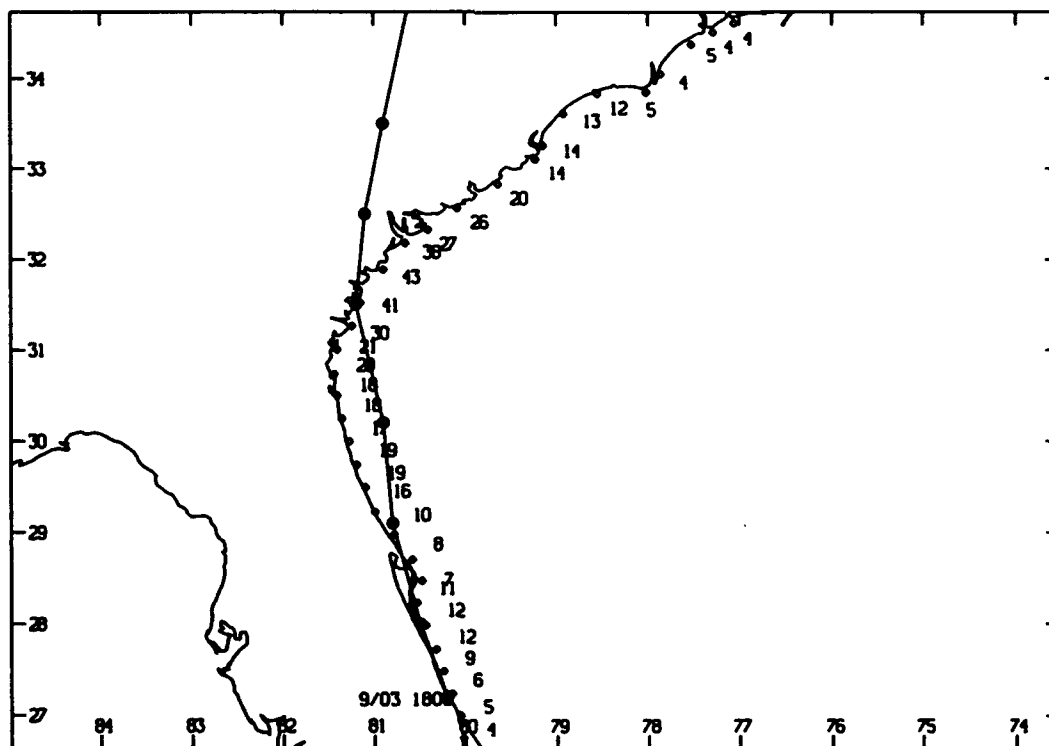
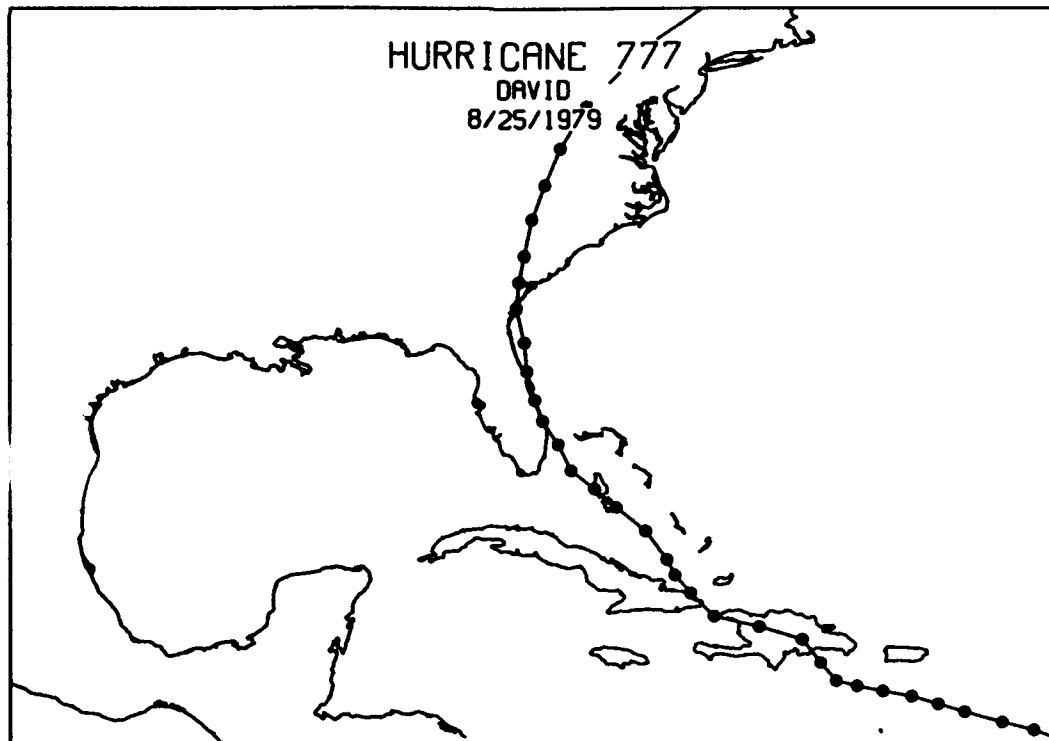


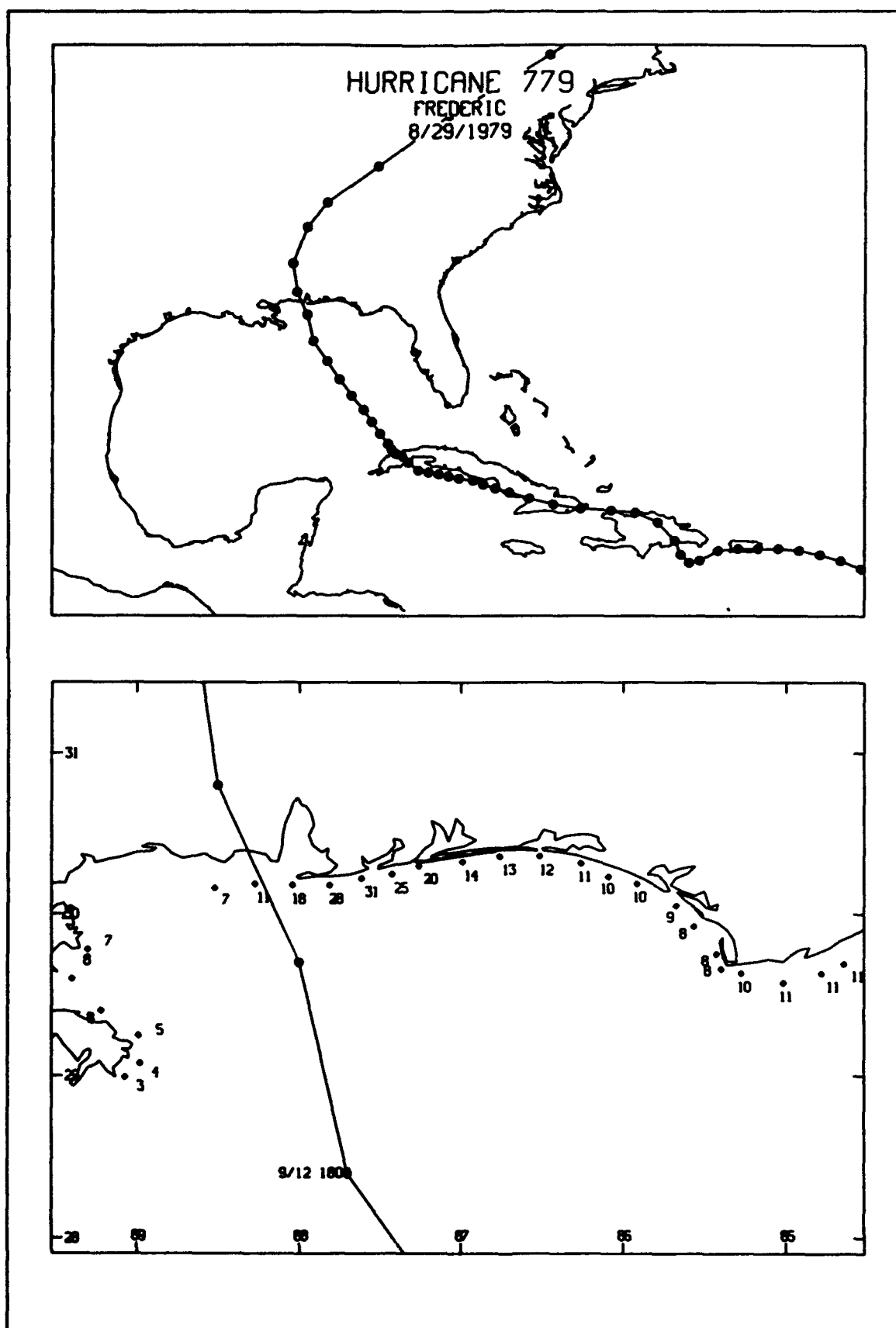


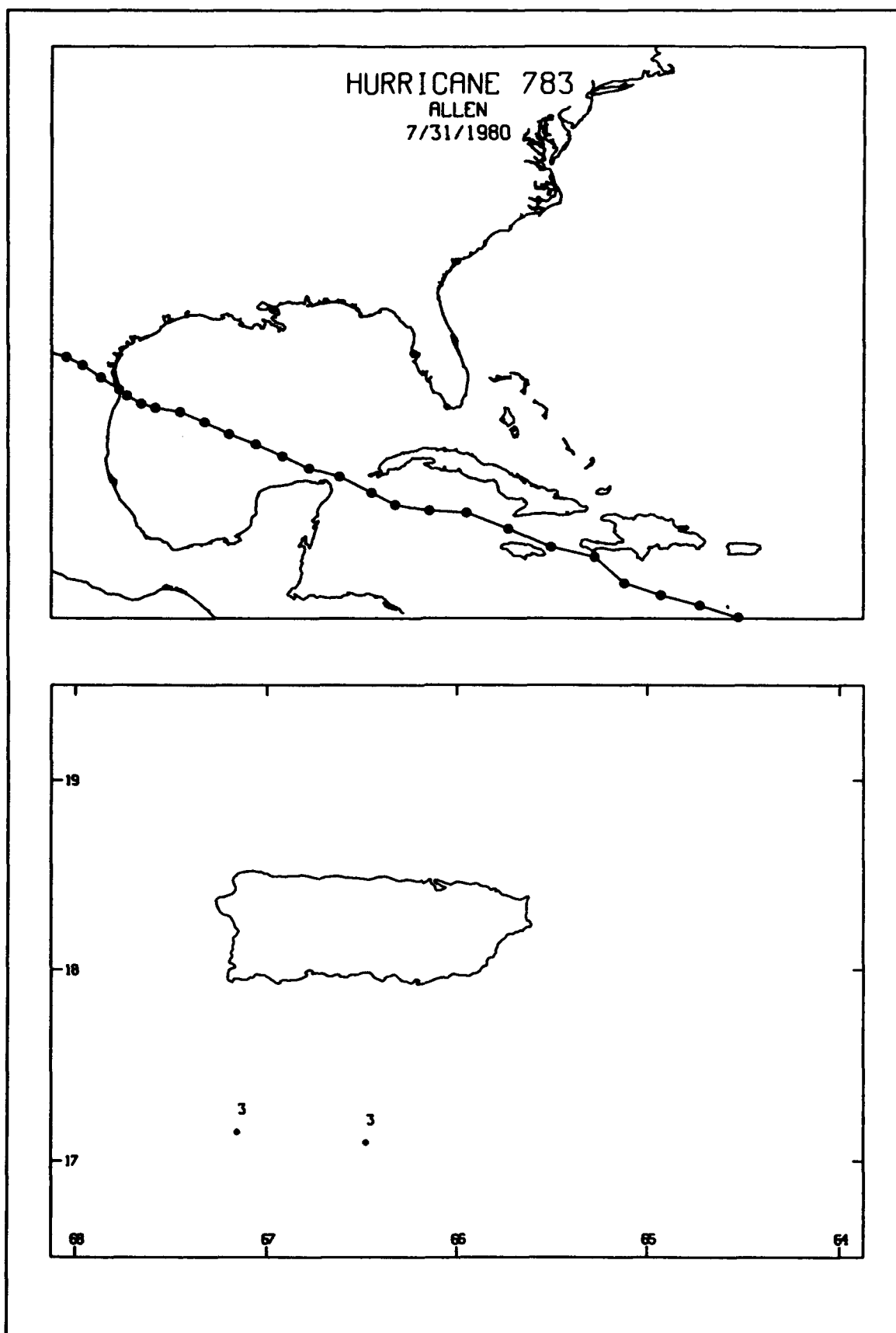


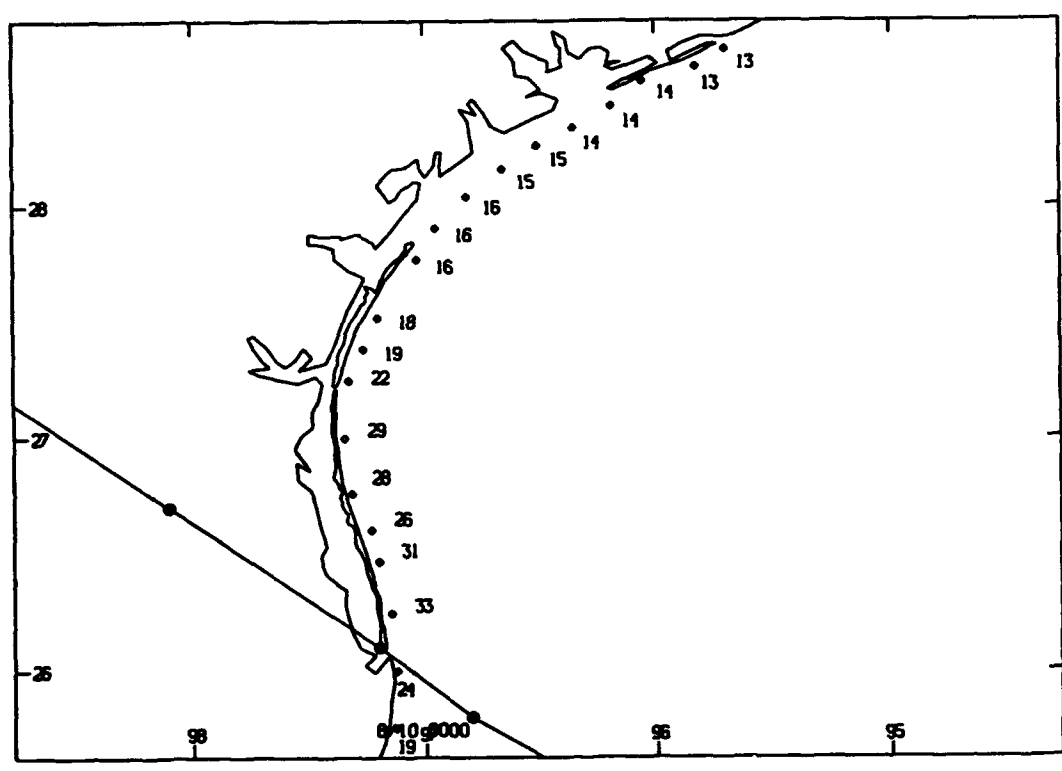
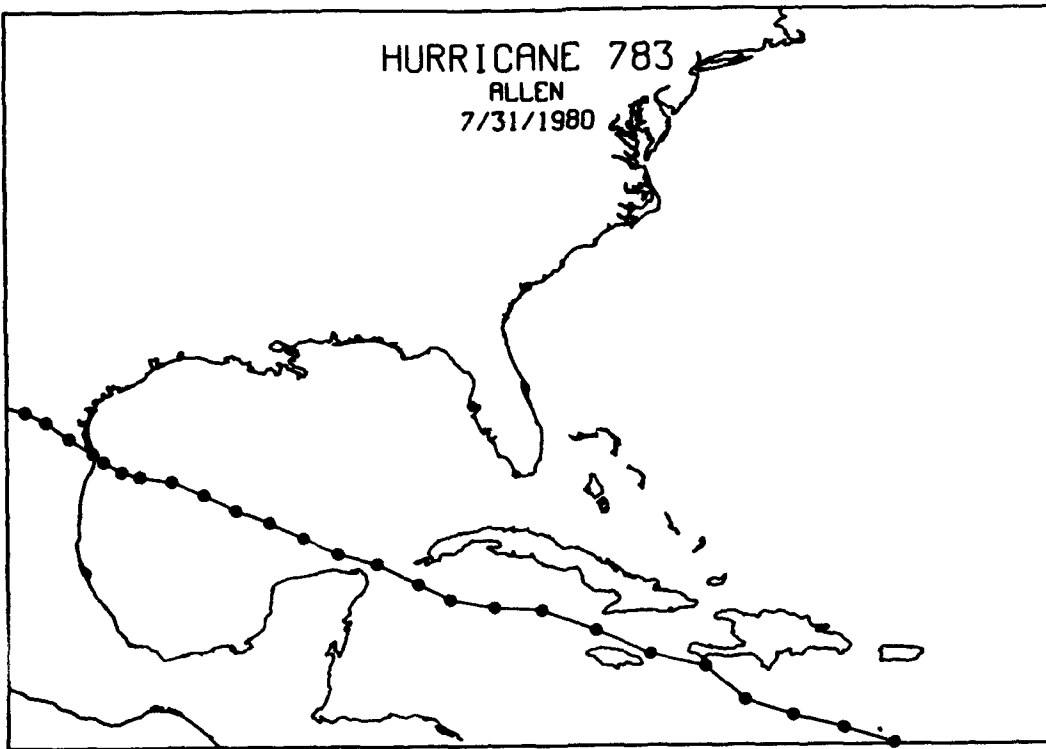


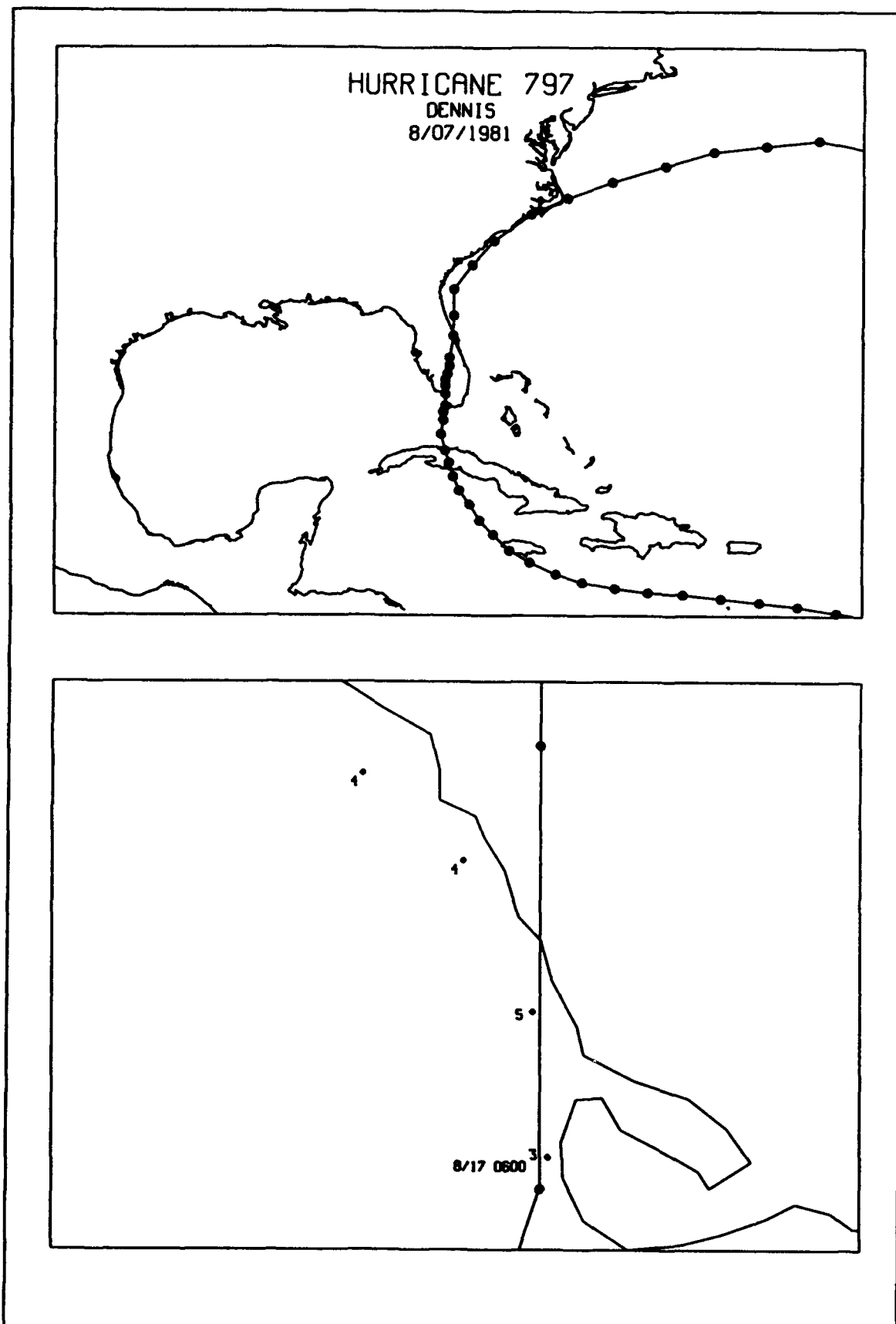


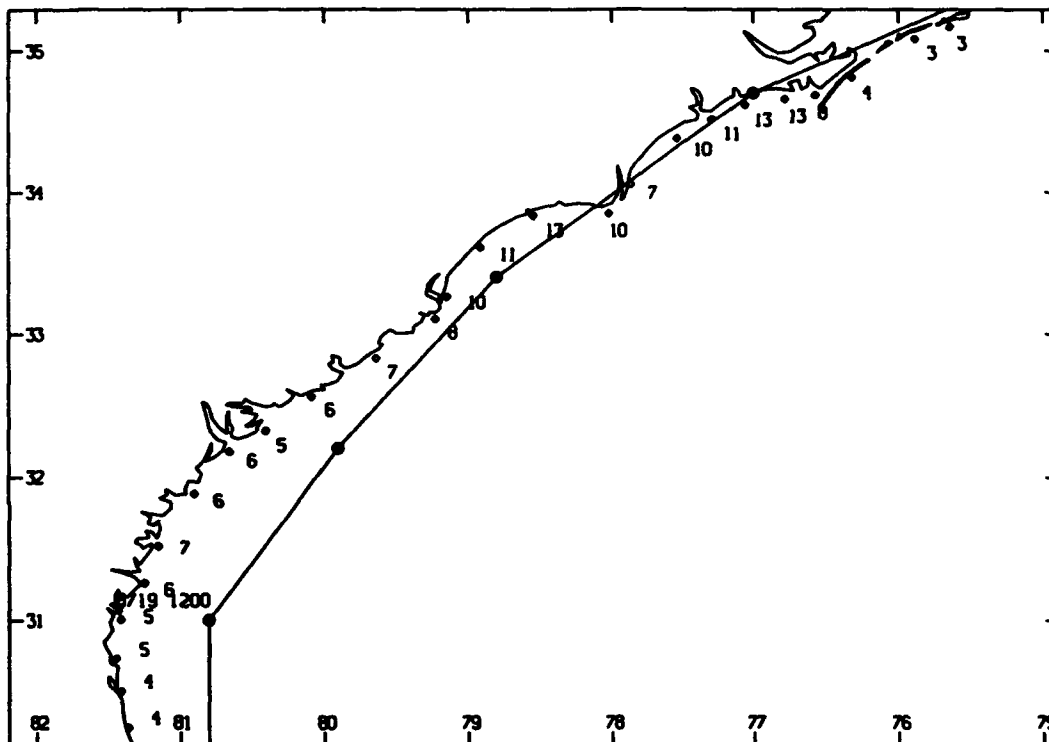
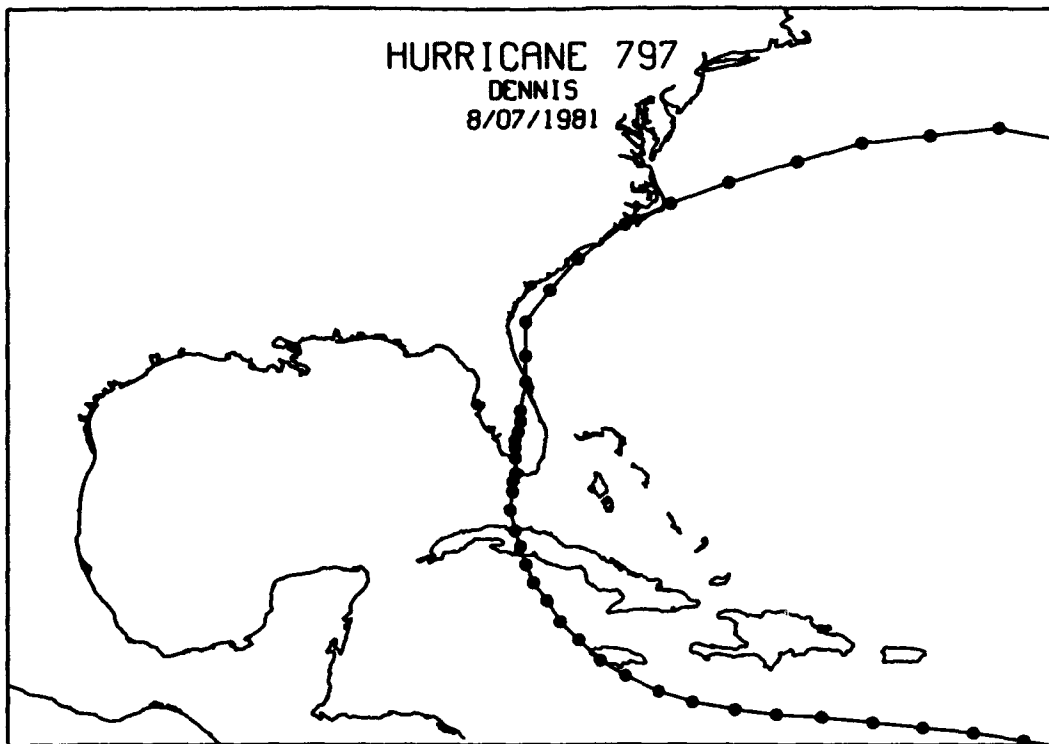


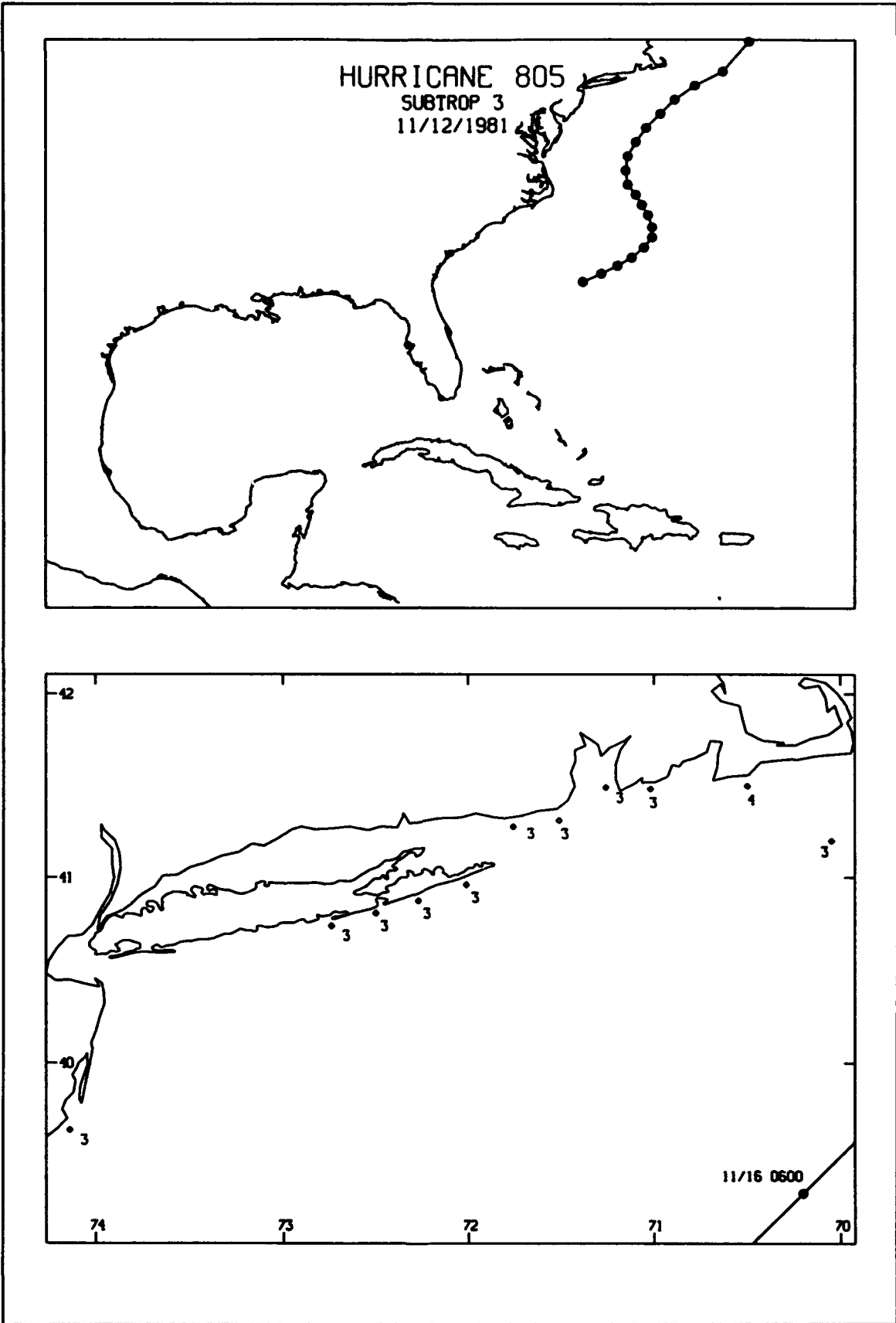


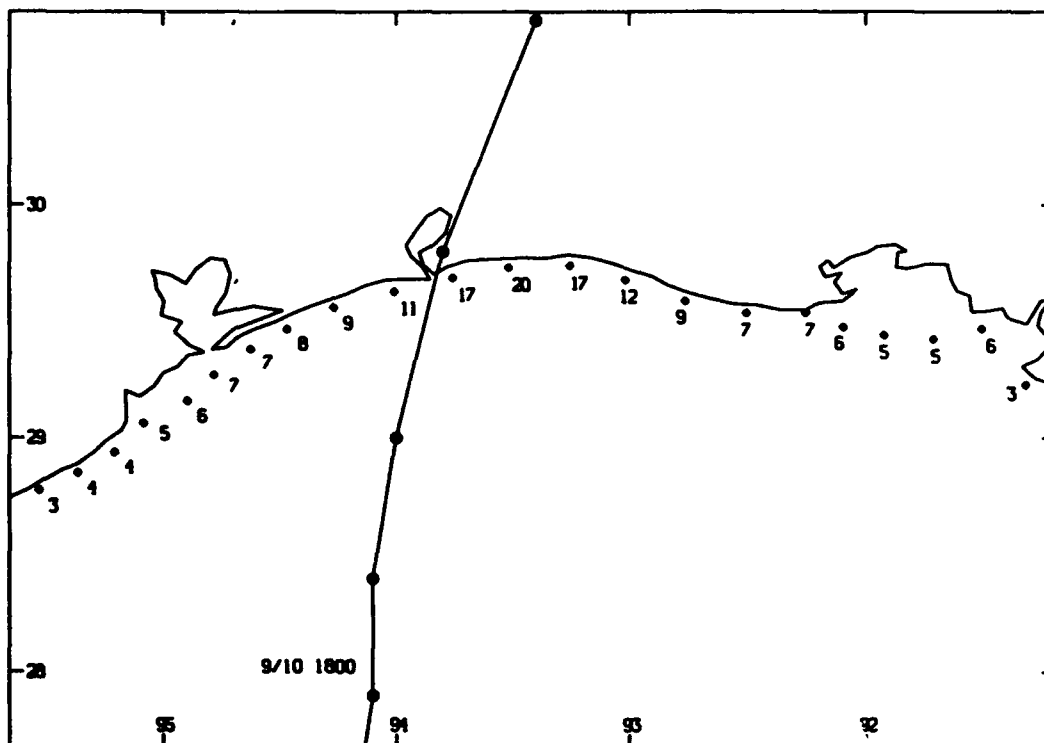
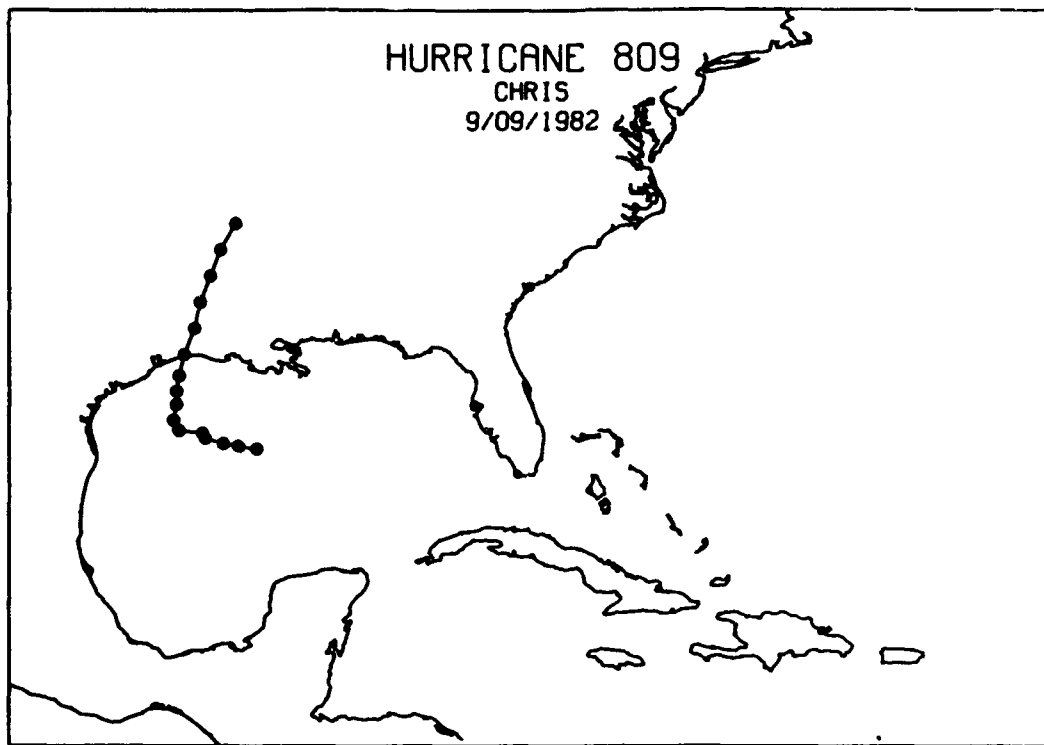


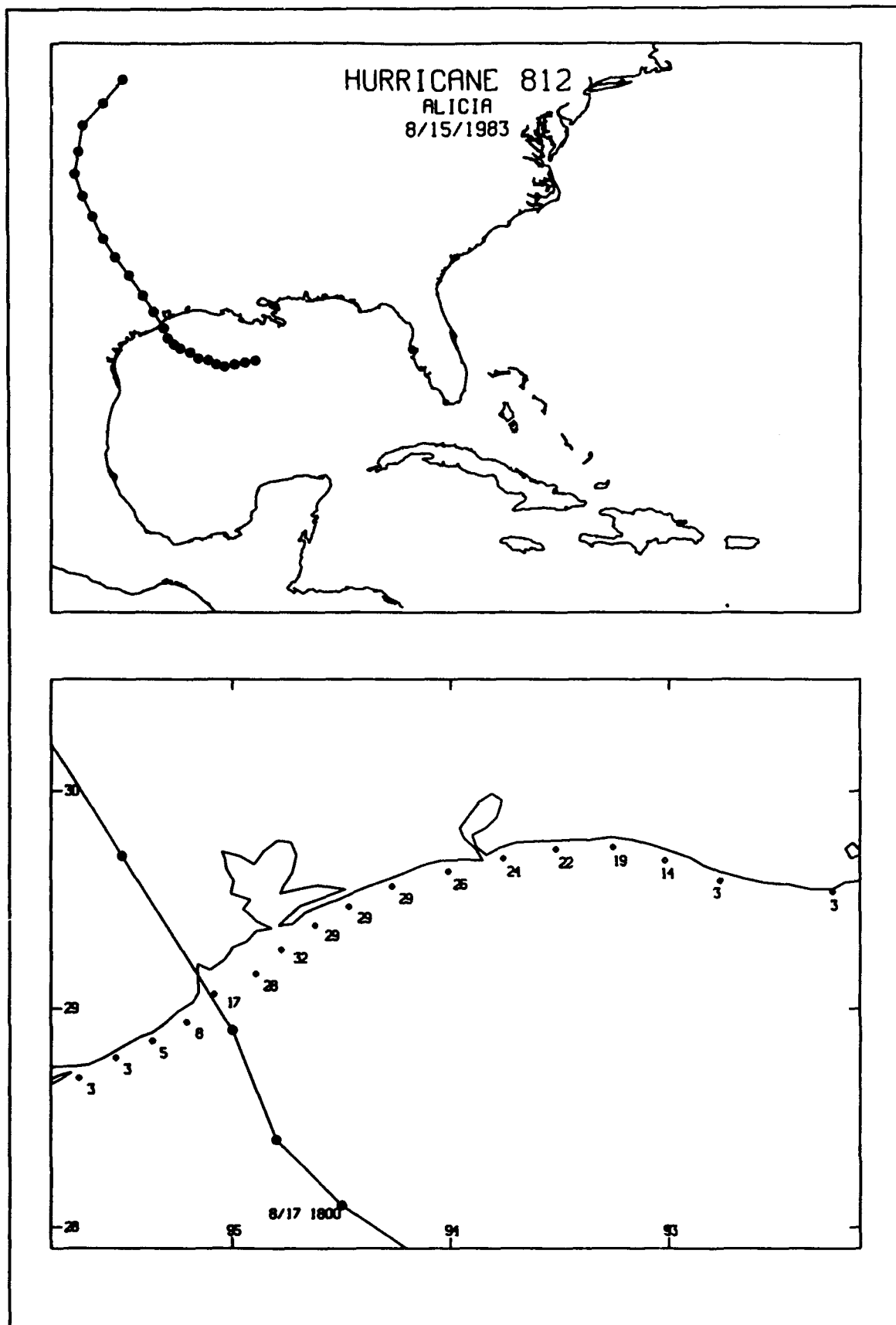


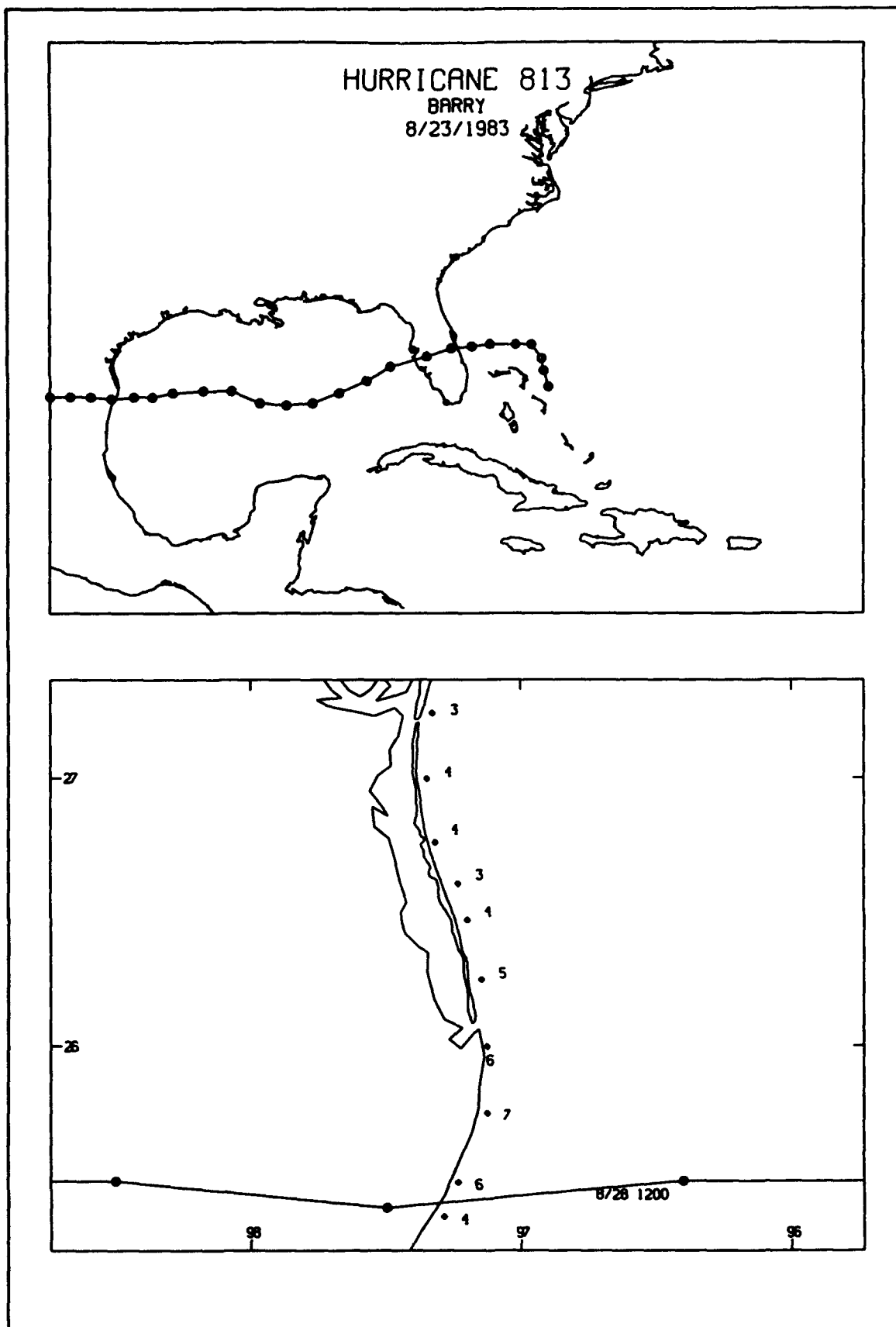


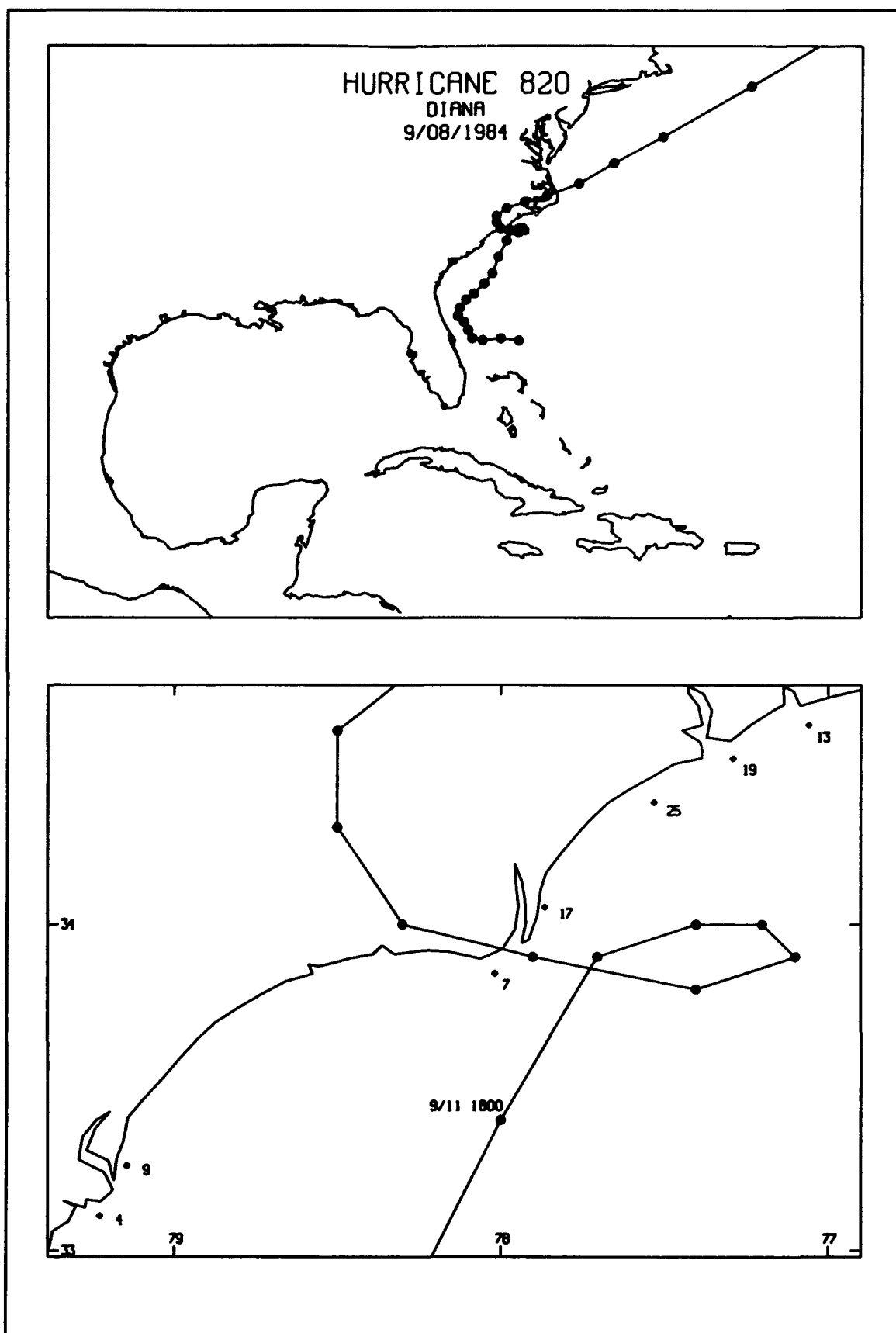


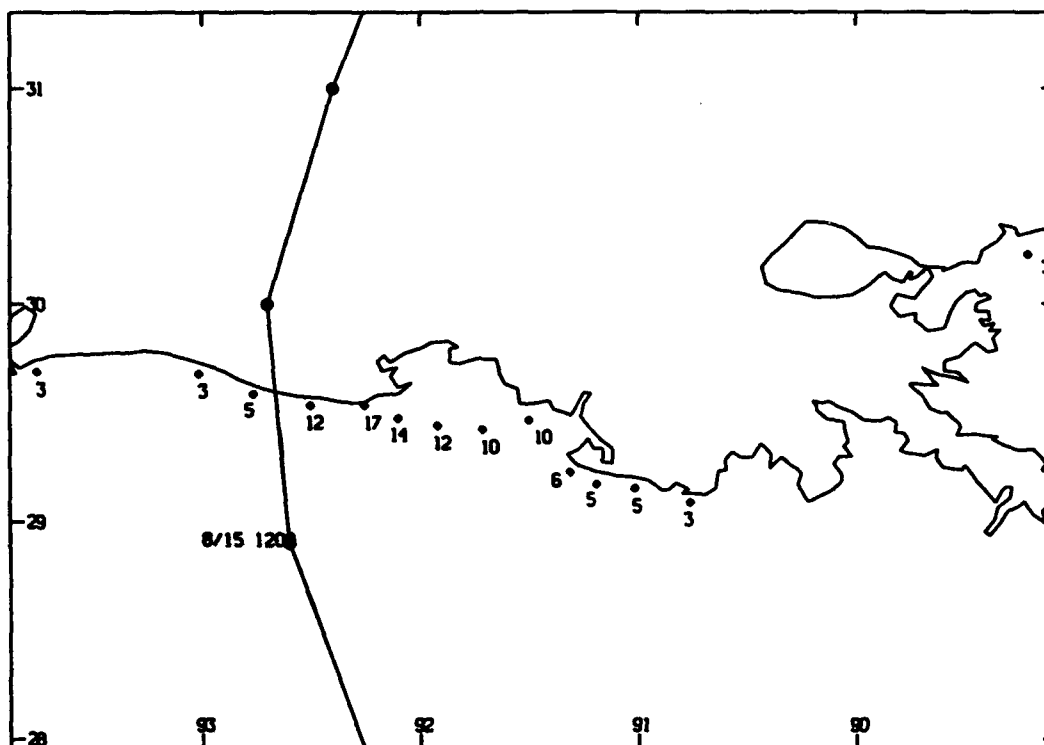
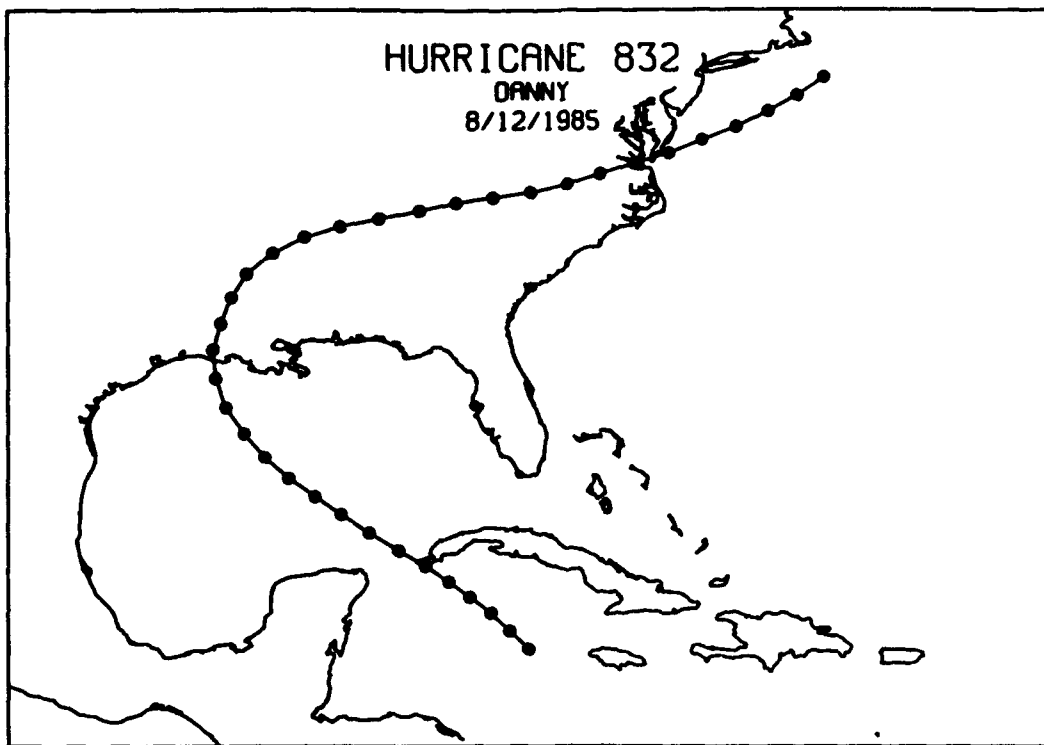


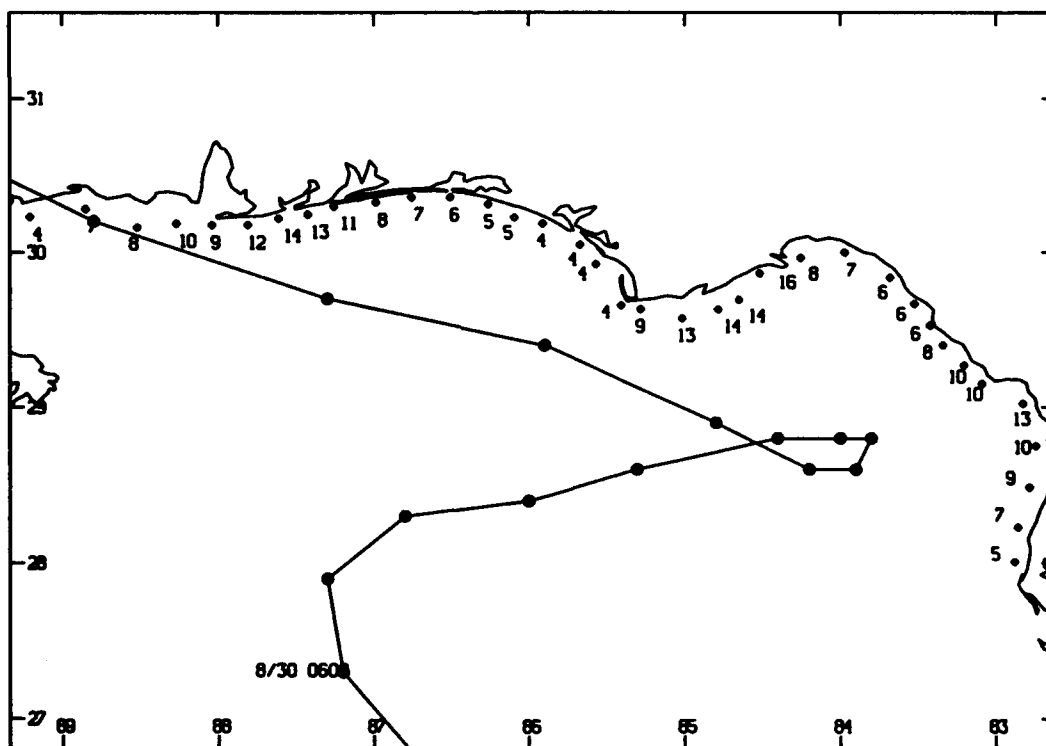
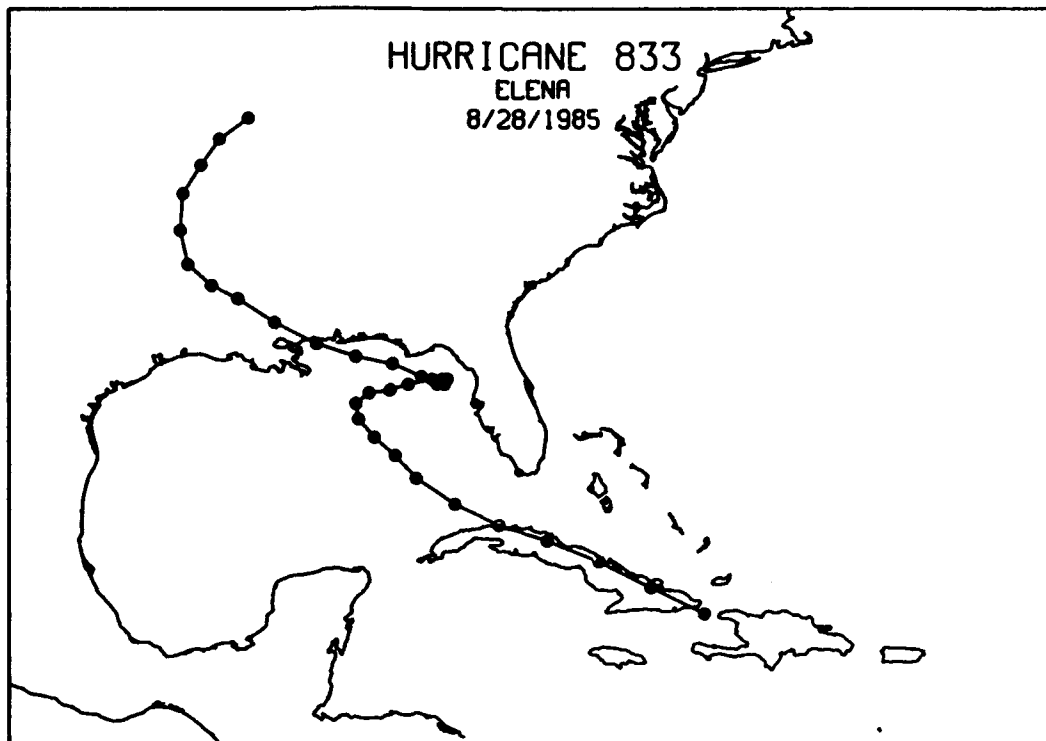


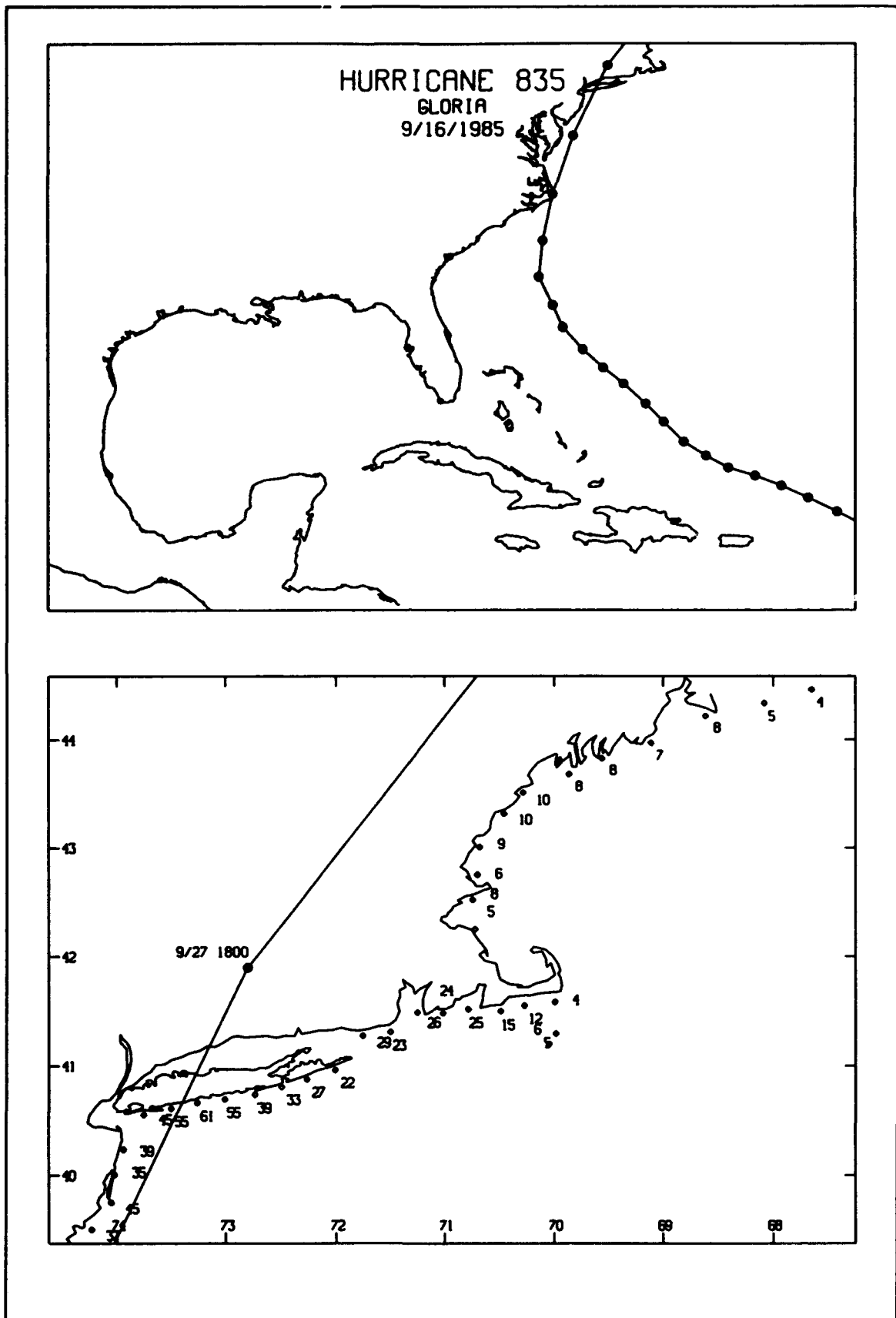


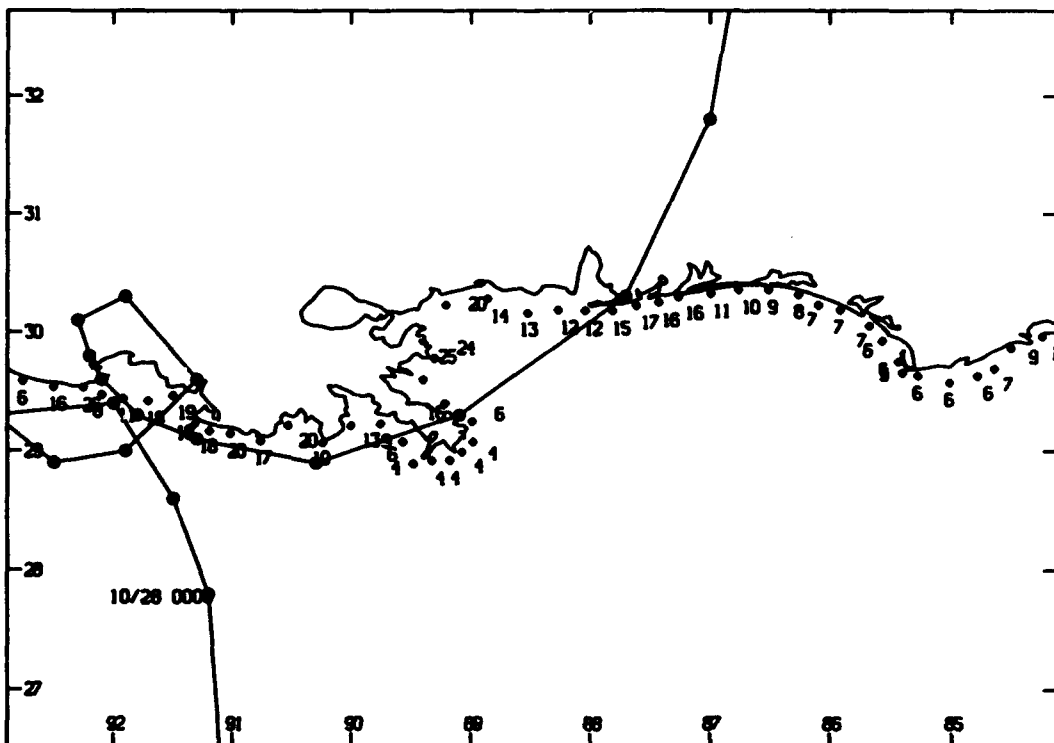
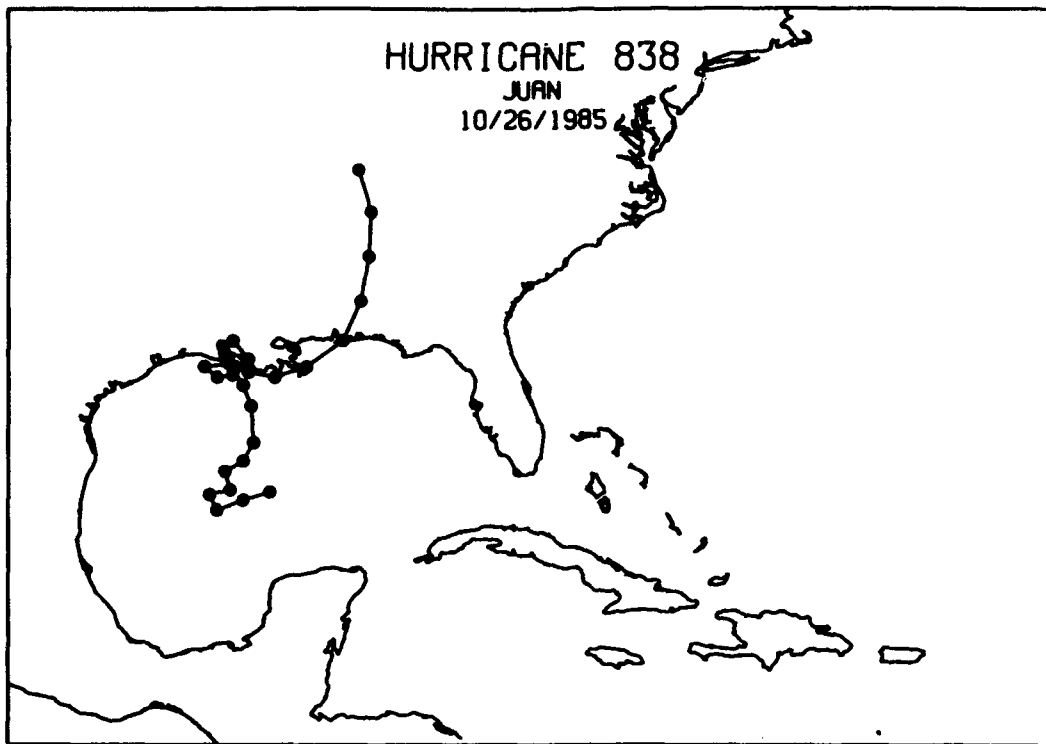


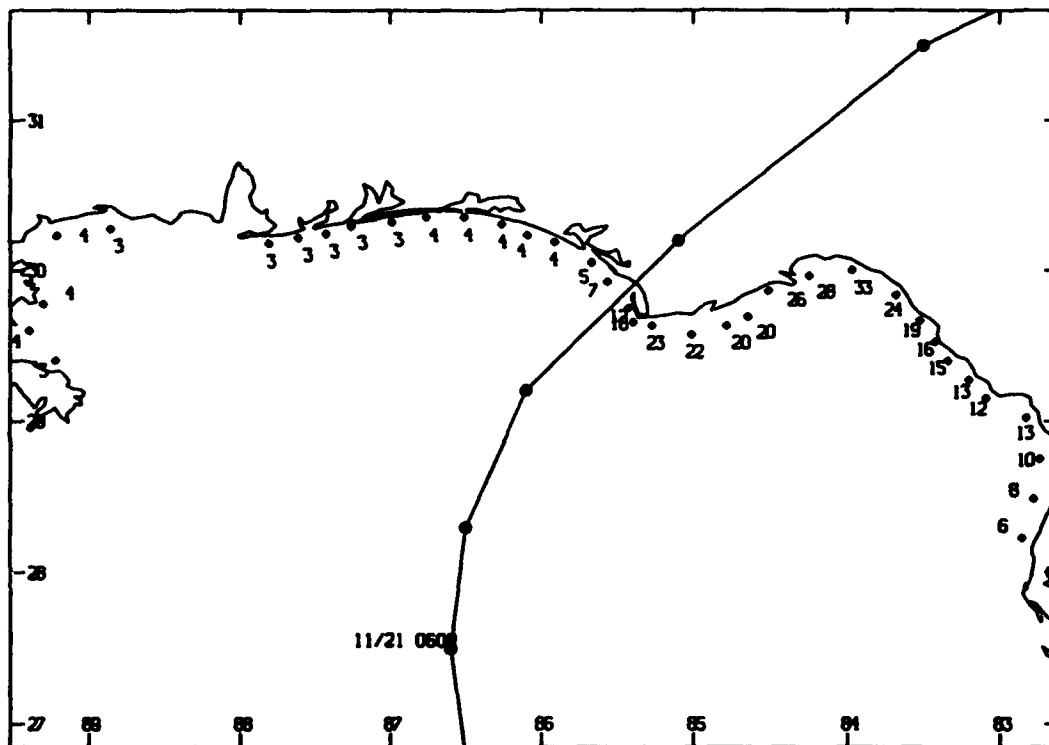
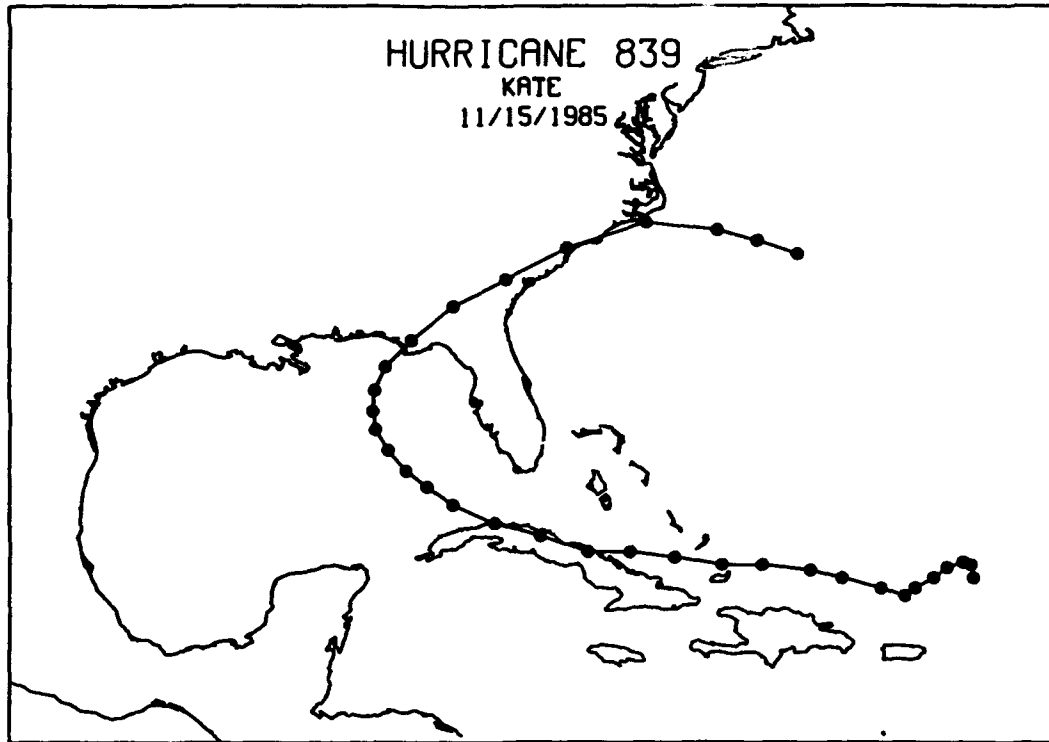


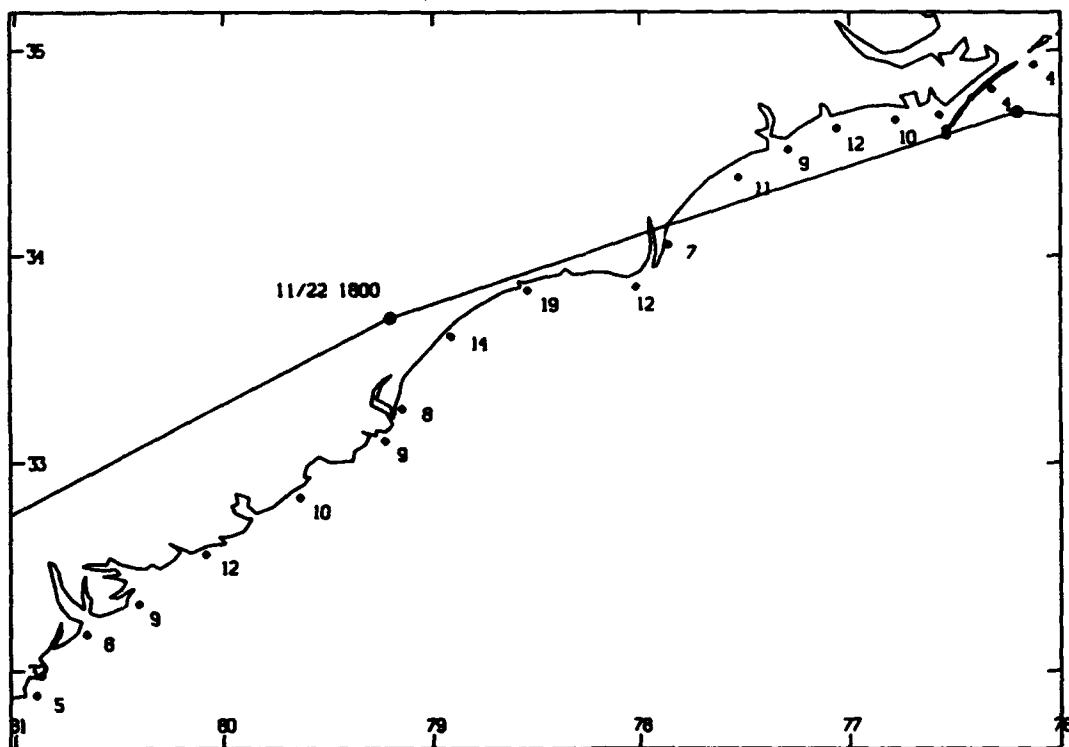
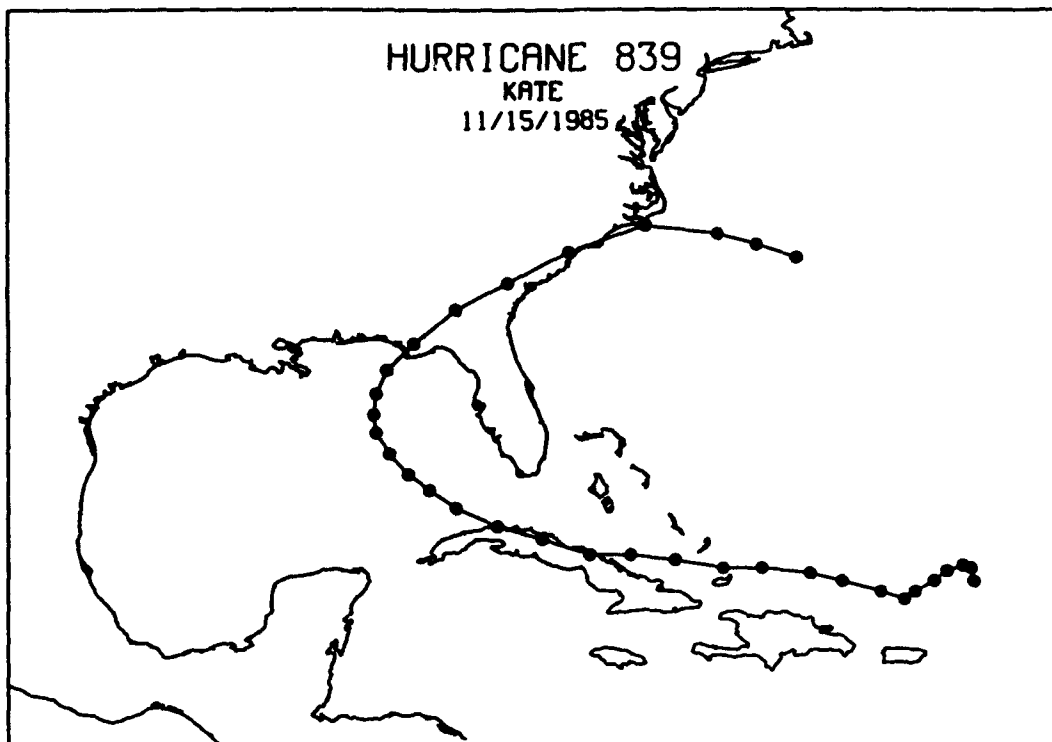


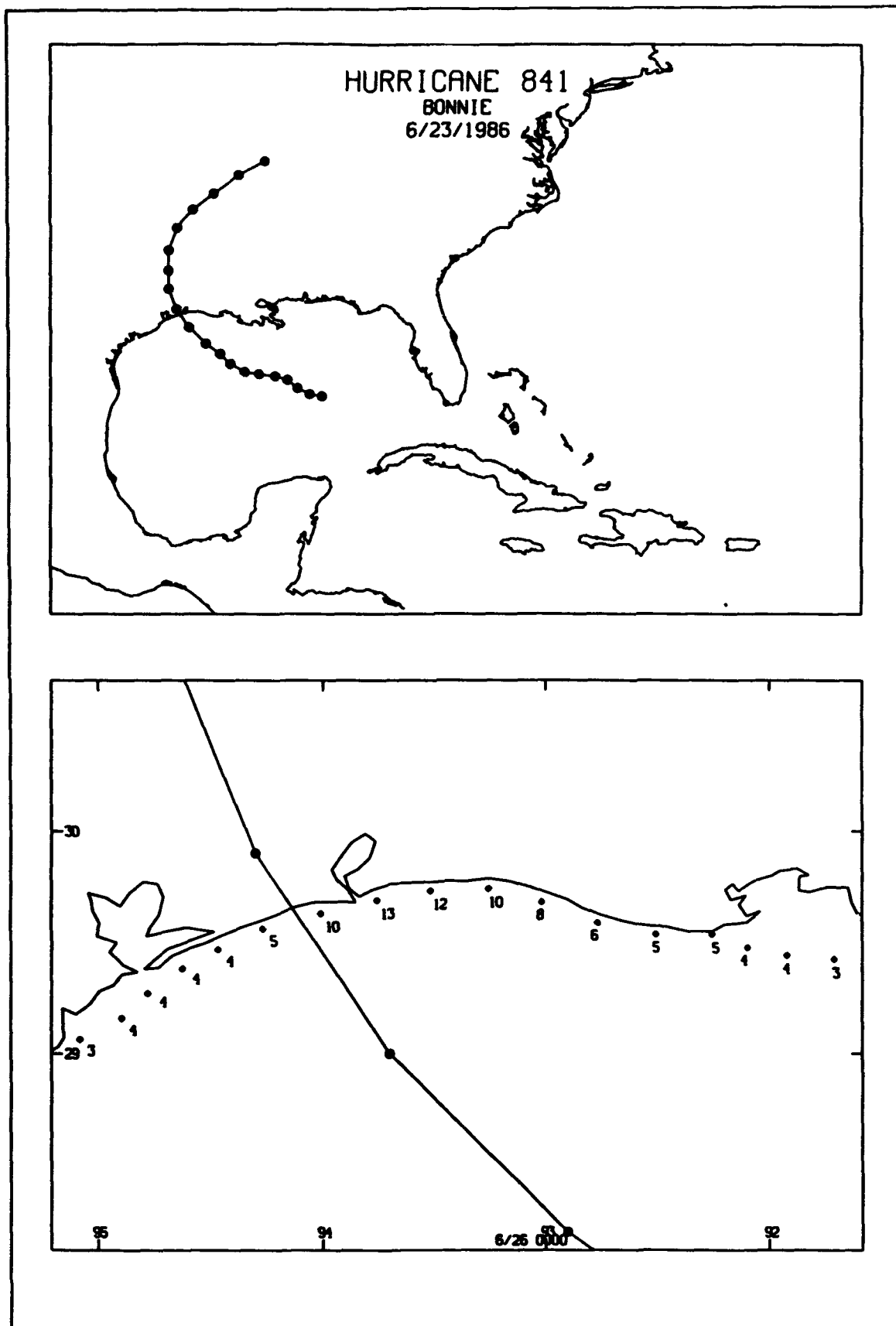


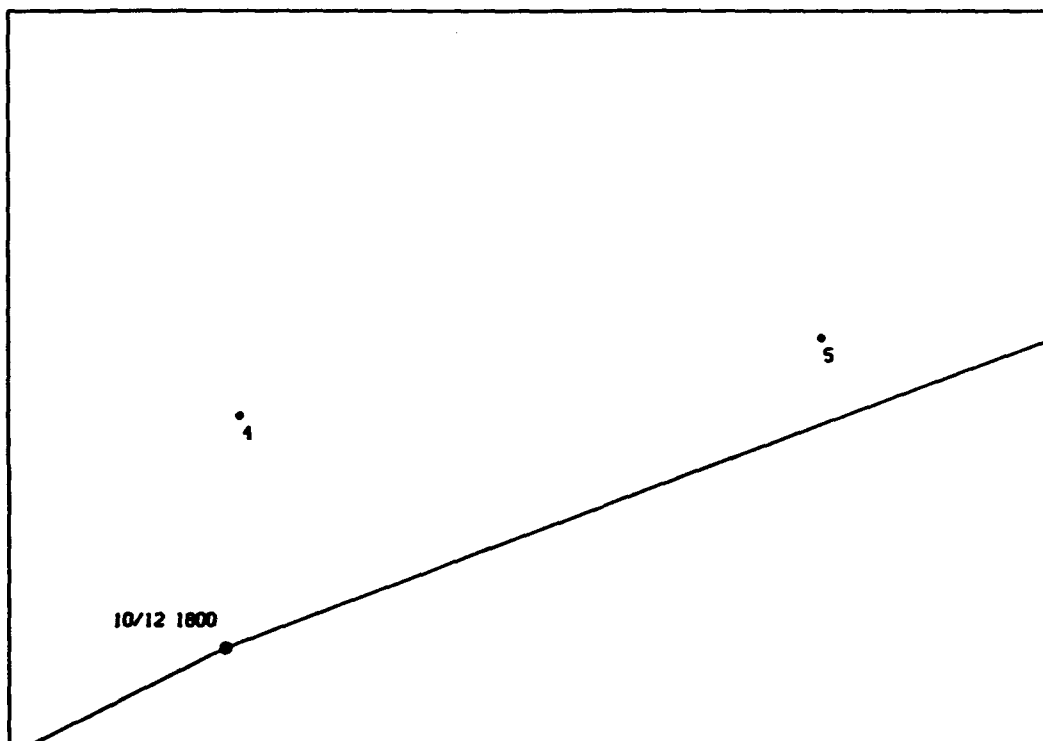
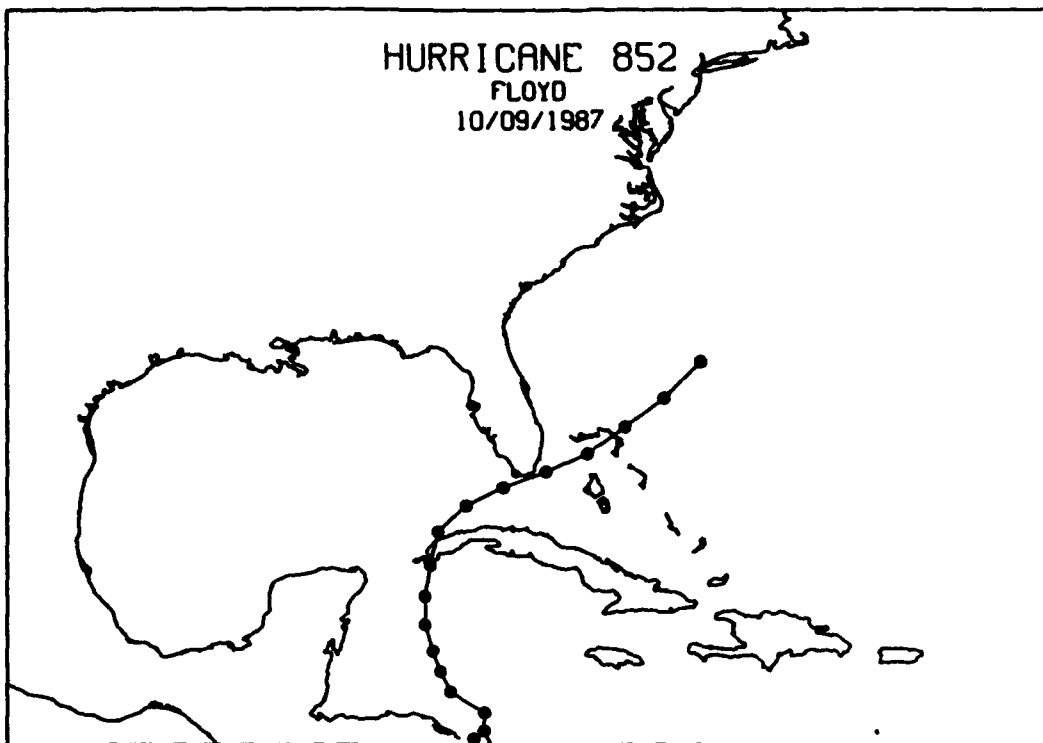


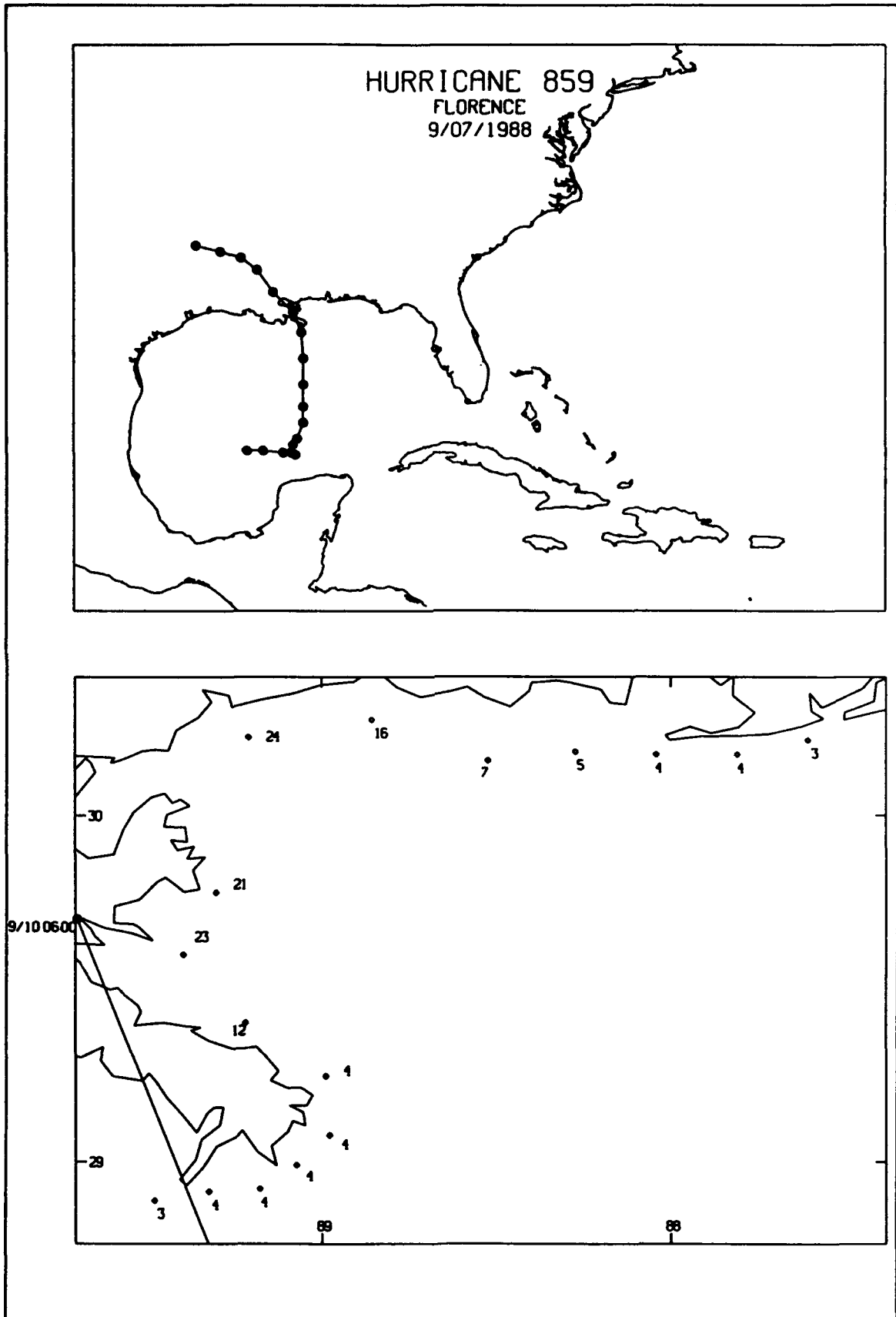


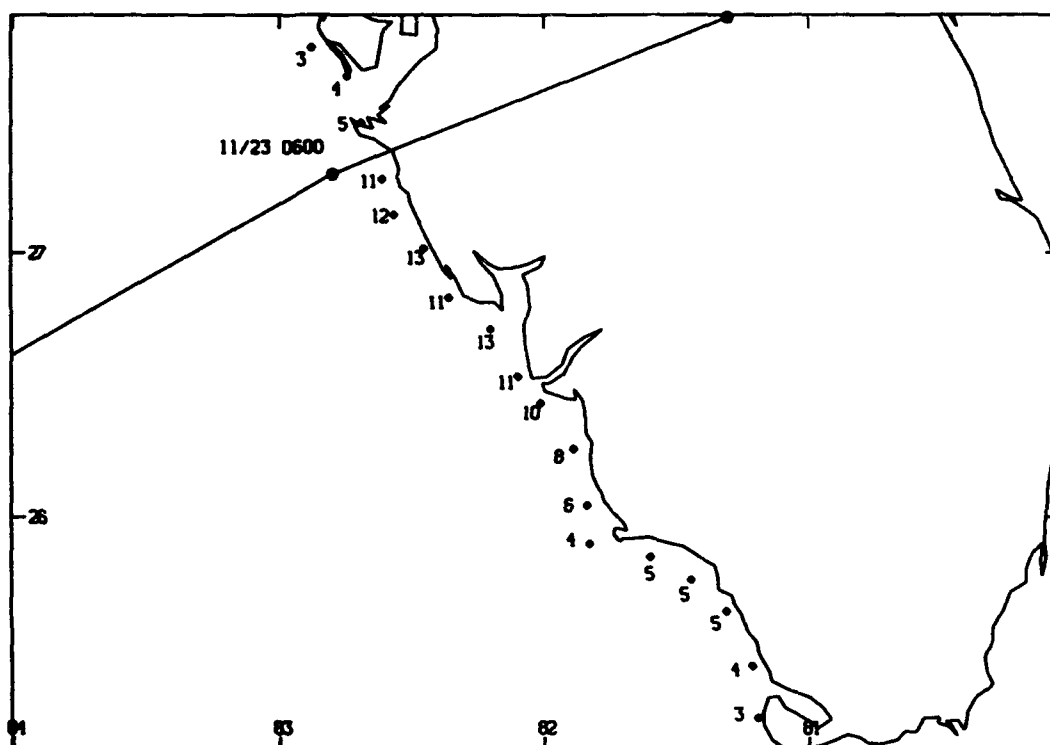
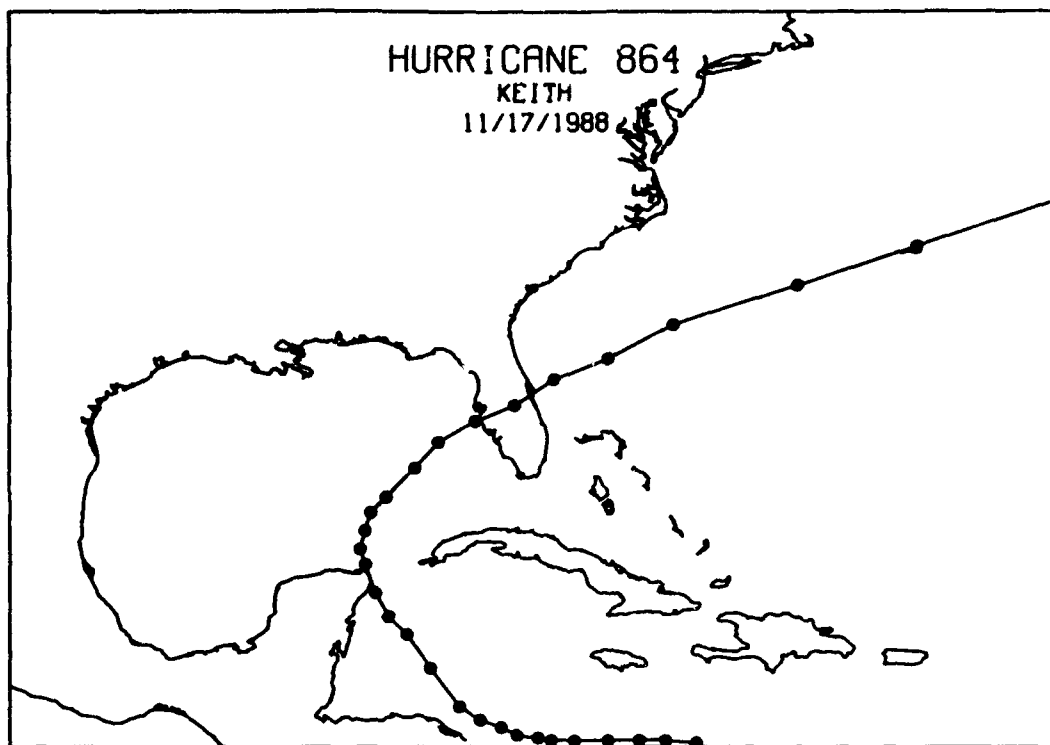


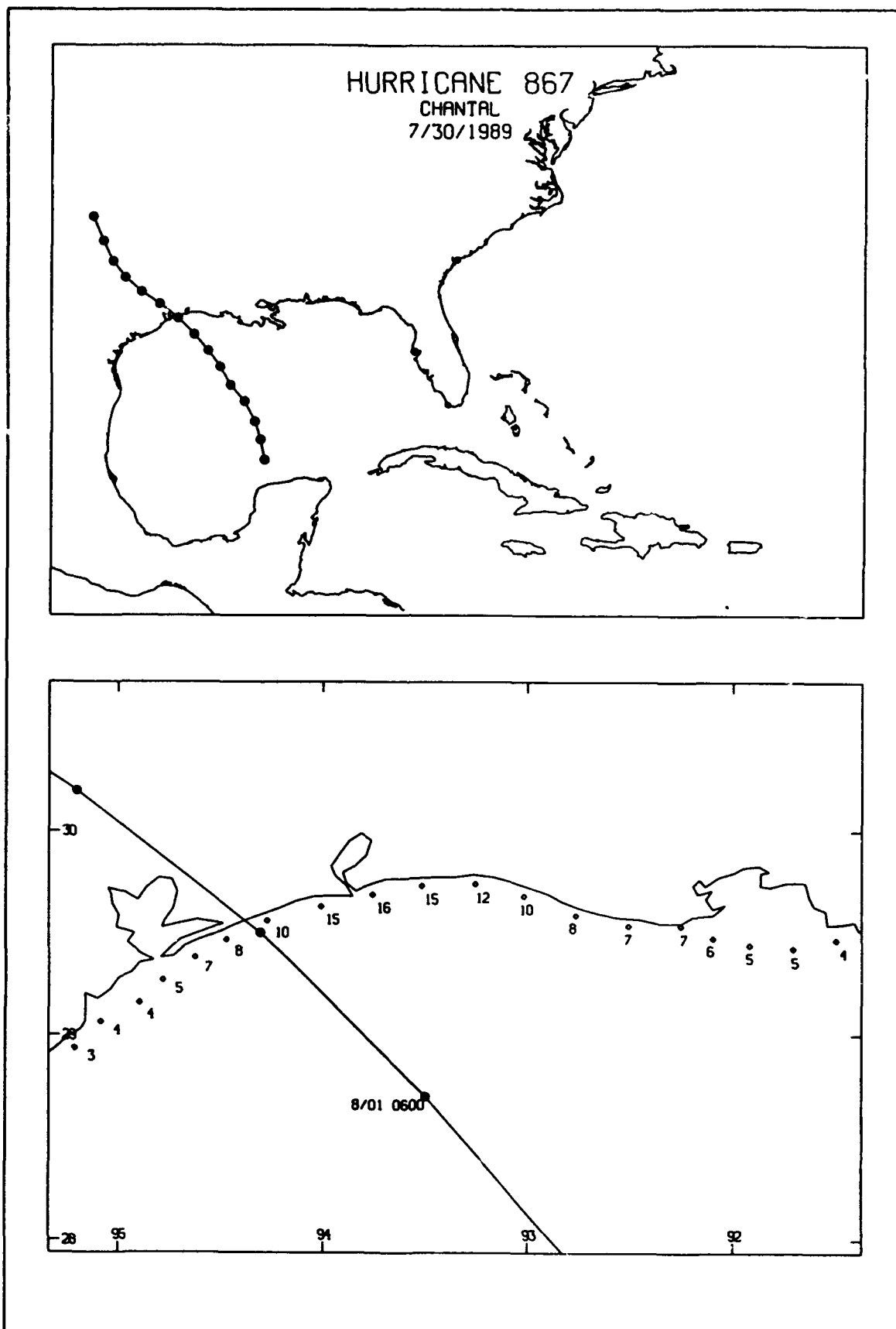


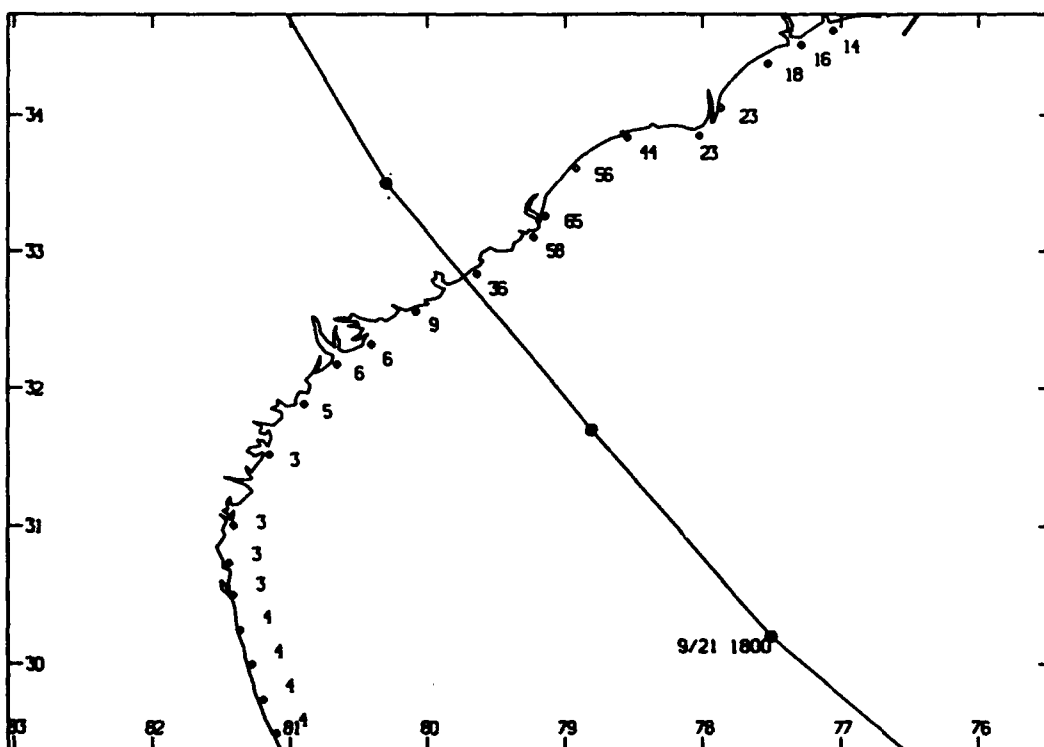
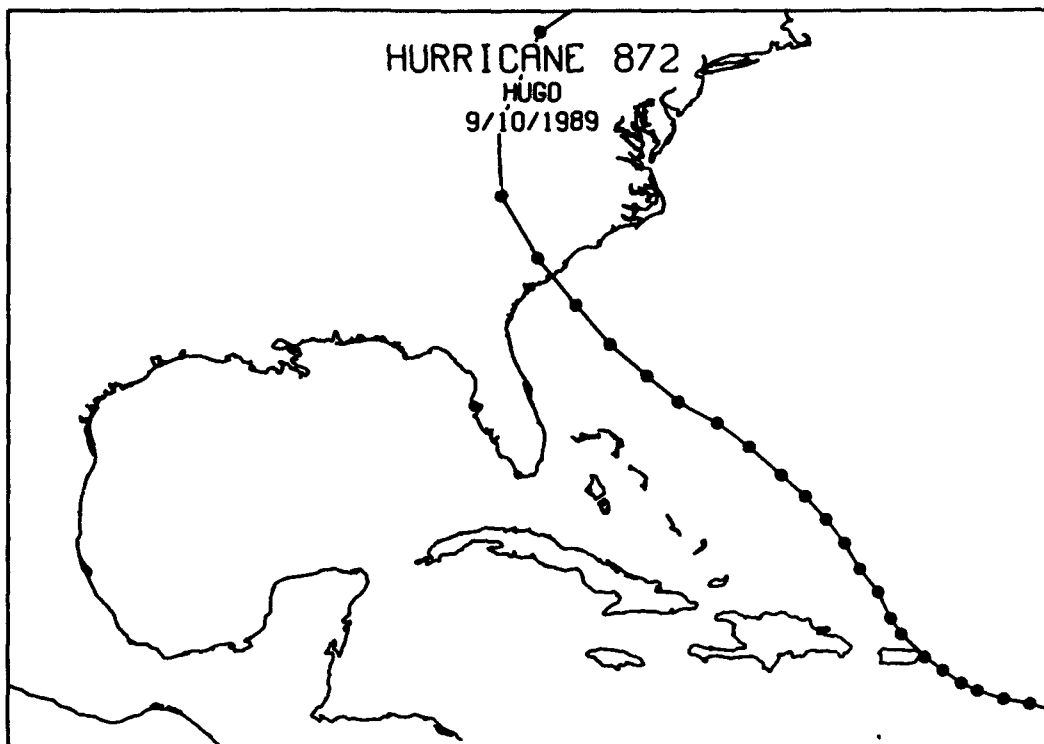


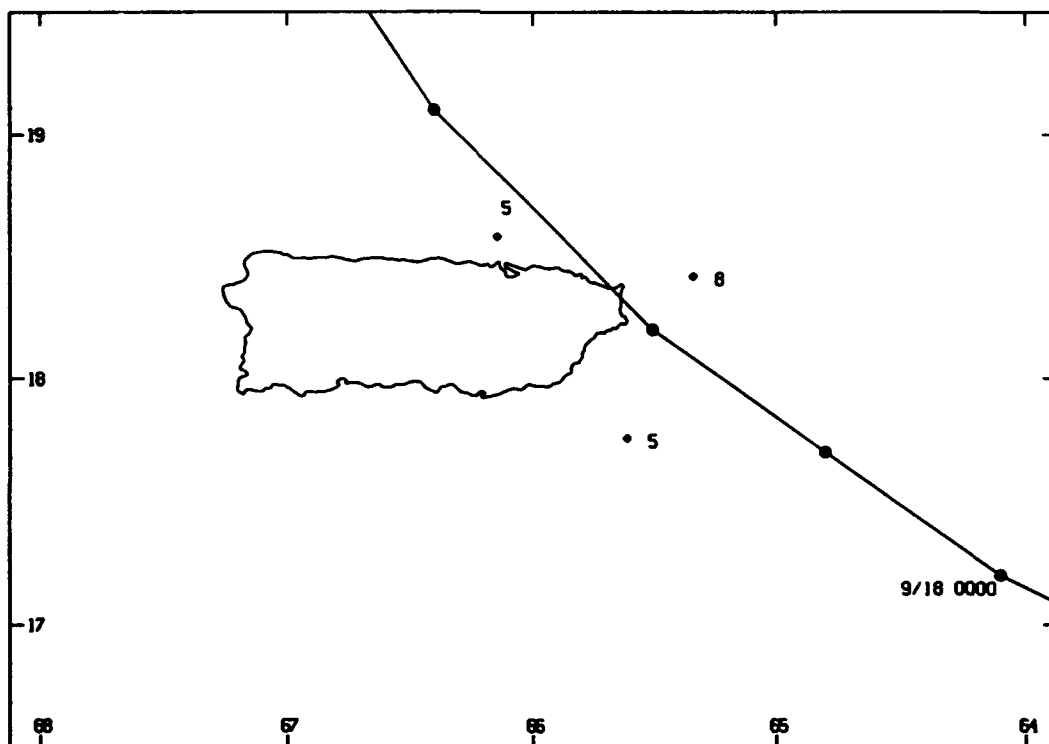
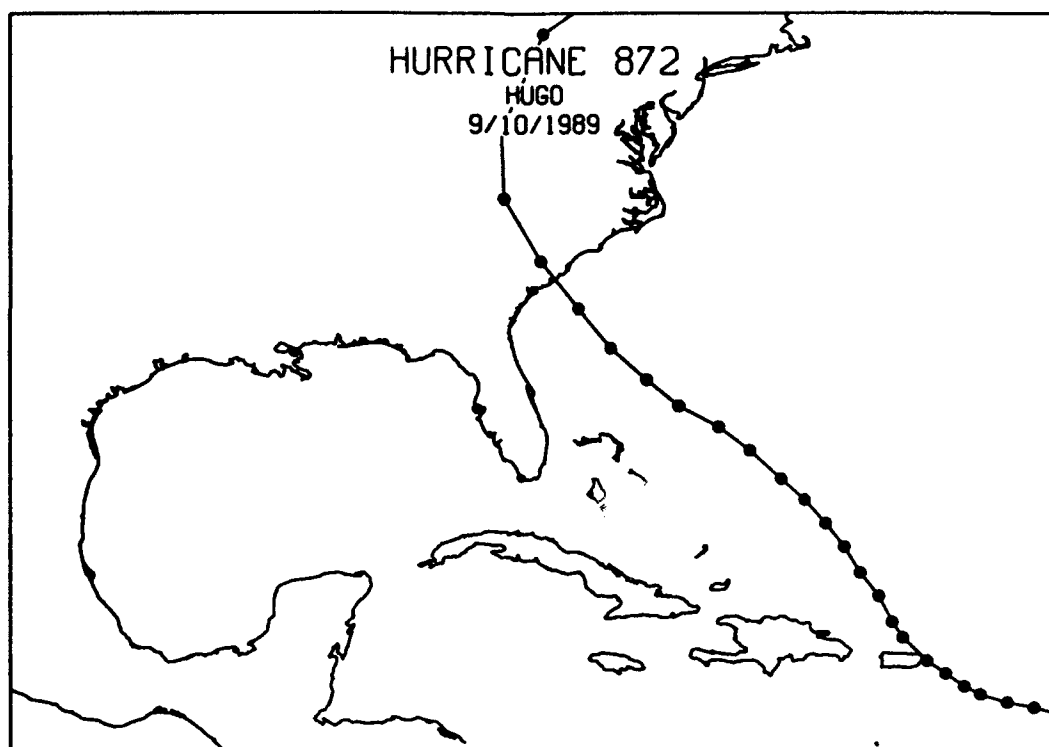


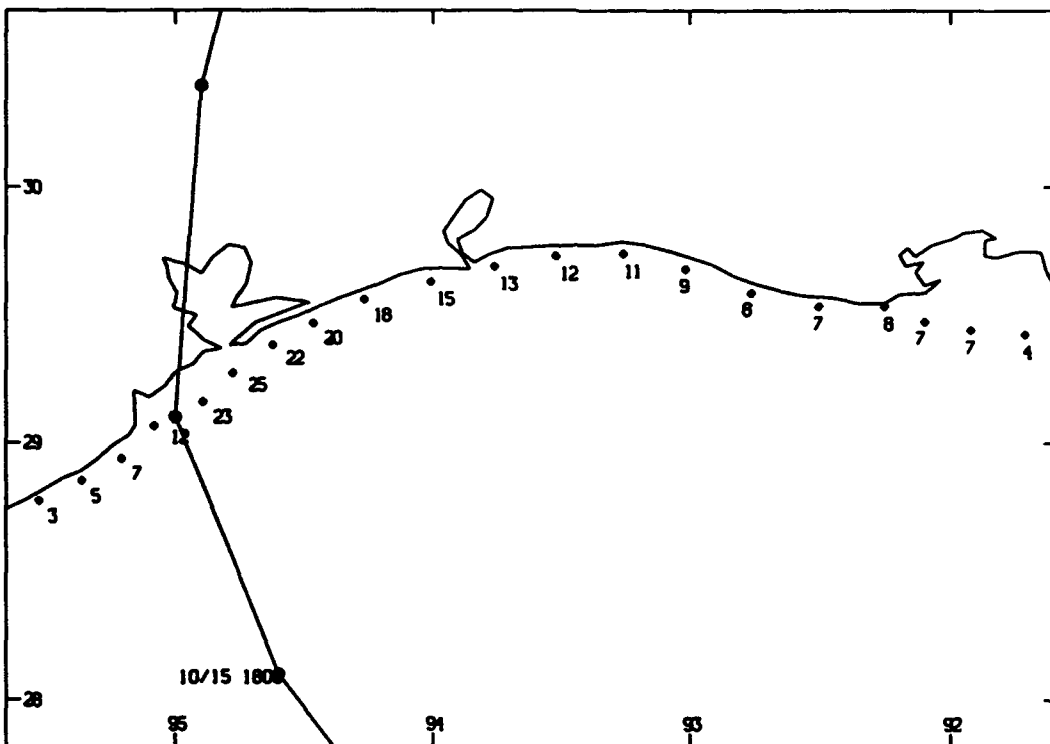
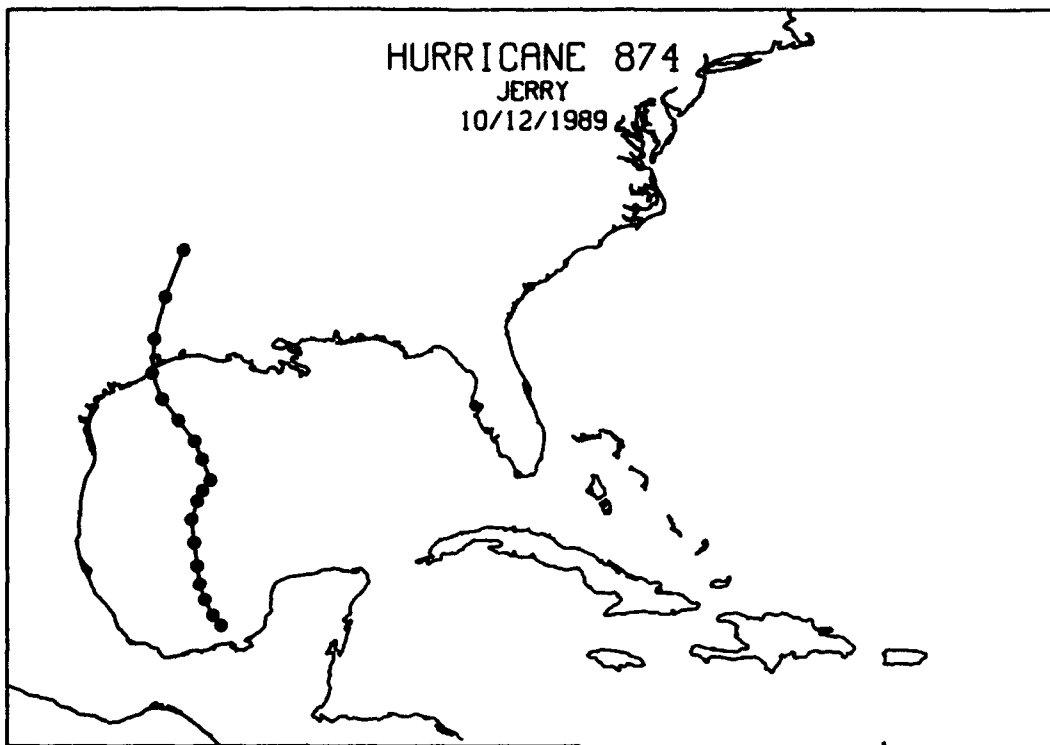












Appendix C

Storm Event and Maximum Surge Elevation Cross-Reference

TOTAL EVENTS: 134

HURDAT STORM 5, # STATIONS-MAX SURGE 41

120- 3 121- 5 122- 6 123-12 124- 9 125- 6 126- 9 127- 7 128- 5 129- 7 130- 6 131- 5 132- 6 133- 5 134- 6
135- 5 136- 4 137- 5 138- 4 139- 4 140- 3 539- 4 540- 4 541- 5 542- 5 543- 5 544- 6 545- 6 546- 6 547- 6
548- 7 549- 7 550- 8 551- 8 552-11 553-11 554-12 555-13 556-11 557- 5 558- 3

HURDAT STORM 72, # STATIONS-MAX SURGE 29

254- 3 255- 6 256- 6 257- 6 258- 7 259- 7 260- 8 261- 9 262- 9 263-13 264- 8 265- 6 266- 4 267- 3 416- 5
417- 7 418-11 419-16 420-20 421-15 422- 9 423- 8 424- 7 425- 7 426- 6 427- 6 428- 6 429- 4 430- 3

HURDAT STORM 76, # STATIONS-MAX SURGE 90

154- 9 155-13 156-16 157-14 158-11 159- 6 160- 5 161- 4 162- 3 164- 4 165- 6 166-11 167-20 168-32 169-41
170-30 171-22 172-17 173-14 174-11 175- 8 176- 7 177-12 178- 9 179- 8 180- 9 181- 9 182- 6 183- 7 184- 8
185- 6 186- 7 187- 5 188- 7 189- 7 272- 6 275- 4 276- 3 278- 4 282- 3 397- 3 400- 5 401- 5 404- 6 405-10
406-10 407- 8 408- 6 410- 5 411-10 412- 5 486-14 487-12 489- 9 490- 9 491- 8 492- 7 493- 7 494- 8 495- 9
496-10 497- 9 498-10 499-11 500-11 501-11 502-15 503-16 504-18 505-19 506-21 507-24 508-29 509-31 510-38
511-45 512-22 513-43 514- 8 515- 6 516- 5 517- 5 518- 7 519- 7 520-13 521-19 522-25 523-16 524-10 525- 6

HURDAT STORM 94, # STATIONS-MAX SURGE 40

193- 3 194- 4 195- 4 196- 3 197- 3 198- 4 199- 7 200- 5 201- 7 202- 6 203- 5 204- 5 205- 4 206- 4 207- 3
208- 4 209- 3 416- 4 417- 3 418- 4 419- 3 469- 3 470- 4 471- 4 472- 5 473- 5 474- 5 475- 5 476- 6 477- 9
478-11 479- 7 480- 8 481- 4 482- 3 483- 3 484- 4 485- 5 486- 4 487- 3

HURDAT STORM 103, # STATIONS-MAX SURGE 11

263- 4 264- 5 265- 6 266- 5 267- 4 415- 3 416- 6 417-10 418-11 419- 6 420- 4

HURDAT STORM 112, # STATIONS-MAX SURGE 109

230- 5 231- 4 232- 3 237- 3 238- 4 239- 4 240- 4 241- 4 242- 4 243- 4 244- 5 245- 5 246- 5 247- 6 248- 6
249- 8 250- 8 251- 7 252- 6 253- 5 254- 4 255- 7 256- 6 257- 5 258- 5 259- 4 260- 4 261- 4 262- 3 263- 4
264- 4 265- 3 267- 3 268- 3 282- 4 283- 5 285- 4 288- 6 289-10 290-10 291- 8 292- 6 293- 5 294- 4 295- 3
296- 3 297- 4 298- 3 385- 3 386- 4 387- 4 388- 4 389- 6 390- 6 391- 9 392-10 393-13 394-12 395- 8 396- 5
397- 5 398- 7 399- 7 400- 7 401- 3 413- 4 414- 3 415- 4 416- 3 417- 3 418- 3 419- 4 420- 4 421- 4 422- 5
423- 5 424- 5 425- 6 426- 6 427- 7 428- 7 429- 7 430- 6 431- 7 432- 7 433- 9 434-10 435- 9 436- 7 437- 6
438- 5 439- 5 440- 4 441- 4 442- 4 443- 4 444- 4 445- 4 446- 4 447- 3 678- 7 679- 6 680- 7 681- 7 682- 6
683- 5 684- 3 685- 4 686- 5

HURDAT STORM 117, # STATIONS-MAX SURGE 59

128- 4 129- 4 130- 6 131- 7 132-10 133-11 134-19 135-18 136-16 137-24 138-21 139-18 140-14 141-11 142- 9
143- 9 144- 9 145- 9 146- 7 147- 6 148- 6 149- 5 150- 5 151- 5 152- 4 153- 5 154- 4 155- 3 229- 3 449- 3
450- 4 451- 3 513- 4 524- 4 525- 5 526- 5 527- 5 528- 4 529- 5 530- 6 531- 7 532- 8 533- 9 534- 9 535- 9
536-11 537-15 538-19 539-23 540-25 541-26 542-25 543-23 544-19 545-15 546-11 547- 8 548- 6 549- 4

HURDAT STORM 127, # STATIONS-MAX SURGE 110

154- 3 155- 3 156- 5 157- 6 158- 7 159- 5 160- 4 166- 6 167-11 168-18 169-26 170-18 171-12 172- 9 173- 7
174- 6 175- 5 176- 4 177- 7 178- 5 179- 5 180- 5 181- 5 209- 5 210- 5 211- 8 212- 7 213- 6 214- 9 215- 7
216-10 217- 7 218- 5 219- 7 220- 5 22- 6 222- 6 223- 8 224- 6 225- 5 226- 3 240- 3 241- 3 242- 4 243- 4
244- 4 245- 3 249- 3 250- 3 255- 5 25- 4 427- 3 428- 5 429- 5 430- 3 431- 3 432- 4 433- 5 434- 6 435- 6
436- 5 437- 5 438- 4 439- 4 440- 4 441- 4 442- 4 443- 3 453- 6 457- 8 458- 8 459- 8 460- 9 461- 8 462- 9
463-12 464-14 465-14 466-14 467-11 468- 9 469- 8 470- 5 497- 6 498- 6 499- 6 500- 6 501- 6 502- 8 503- 8
504- 9 505-10 506-11 507-13 508-17 509-40 510-46 511-29 512-13 513-28 514- 4 515- 3 516- 3 517- 3 518- 5
519- 5 520- 8 521- 7 522- 9 523- 4

HURDAT STORM 141, # STATIONS-MAX SURGE 30

189- 5 190- 5 191- 4 192- 7 193- 6 194- 6 208- 5 209- 4 210- 3 211- 5 212- 3 214- 3 425- 3 464- 4 465- 5
466- 6 467- 5 468- 5 469- 5 470- 6 471- 6 472- 8 473- 4 485- 8 486- 8 487- 9 488- 7 489- 7 490- 7 491- 5

HURDAT STORM 183, # STATIONS-MAX SURGE 52

126- 4 127- 4 128- 4 129- 5 130- 5 131- 5 132- 8 133- 8 134-15 135-11 136- 9 137-12 138-10 139- 8 140- 7
141- 6 142- 6 143- 6 144- 5 145- 5 146- 4 147- 4 148- 4 149- 3 526- 3 527- 3 529- 4 530- 4 531- 5 532- 5

533- 6 534- 5 535- 6 536- 7 537- 8 538- 9 539-10 540-11 541-13 542-14 543-15 544-16 545-14 546-10 547- 7
548- 6 549- 5 550- 4 551- 4 552- 4 553- 3 554- 3

HURDAT STORM 187, # STATIONS-MAX SURGE 16

156- 4 157- 5 158- 3 168- 4 169- 5 170- 3 509- 5 510- 8 511- 6 512- 4 513- 6 520- 4 521- 7 522- 9 523- 4
524- 3

HURDAT STORM 189, # STATIONS-MAX SURGE 26

229- 5 233- 7 234- 7 235- 6 236- 7 237- 7 238- 6 239- 6 240- 5 241- 4 242- 3 441- 3 442- 4 443- 6 444- 8
445- 7 446- 9 447- 8 448- 8 449- 8 450- 7 451- 6 452- 9 454-10 455-10 456-11

HURDAT STORM 194, # STATIONS-MAX SURGE 171

199- 7 200- 7 201-14 202-13 203-11 204-10 205- 9 206- 7 207- 5 208-11 209- 8 210- 8 211-16 212-15 213-13
214-23 215-20 216-33 217-27 218-24 219-37 220-29 221-37 222-37 223-43 224-25 225-20 226-15 227-16 228-11
229-10 233- 6 234- 5 235- 4 236- 4 237- 4 238- 3 239- 3 240- 3 241- 3 249- 4 250- 4 251- 3 252- 3 253- 4
254- 8 255-15 256-14 257-14 258-22 259-24 260-28 261-37 262-28 263-38 264-33 265-29 266-27 267-31 268-23
269-18 270-30 271-28 272-33 273-22 274-24 275-26 276-20 277-16 278-17 279-13 280-16 281-10 282- 9 283- 5
284- 5 285- 7 286- 7 287- 6 288- 7 289- 7 290- 6 291- 5 291- 4 292- 5 293- 7 294- 7 295- 8 296- 9 297-10
298-10 299- 9 400-11 401-15 402-17 403-18 404-24 405-27 406-32 407-33 408-34 409-31 410-29 411-41 412-43
413-42 414-37 415-40 416-41 417-41 418-45 419-49 420-54 421-47 422-51 423-43 424-34 425-29 426-24 427-21
428-18 429-15 430- 8 431- 6 432- 6 433- 7 434- 8 435- 7 436- 5 437- 4 442- 3 443- 4 444- 4 445- 4 446- 5
447- 5 448- 6 449- 8 450-10 451-11 452- 9 453-25 454-17 455-18 456-12 457-40 458-30 459-32 460-51 461-37
462-40 463-43 464-40 465-36 466-34 467-22 468-18 469-13 470-13 471-14 472-13 473-10 474-14 475-17 476-23
477-28 478-24 479-12 480- 8 481- 6 482- 6

HURDAT STORM 196, # STATIONS-MAX SURGE 18

264- 4 265- 6 266-11 267-13 268- 9 269- 5 270- 7 271- 5 272- 4 411- 5 412- 7 413-10 414- 9 415-12 416-16
417-18 418-13 419- 4

HURDAT STORM 211, # STATIONS-MAX SURGE 56

127- 4 128- 6 129- 9 130-12 131-13 132-24 133-24 134-42 135-36 136-31 137-42 138-35 139-30 140-25 141-21
142-17 143-15 144-14 145-13 146- 9 147- 8 148- 7 149- 5 150- 5 151- 5 152- 4 153- 4 154- 4 524- 4 525- 4
526- 5 527- 5 528- 5 529- 5 530- 8 531-10 532-11 533-14 534-14 535-17 536-21 537-26 538-32 539-36 540-40
541-45 542-47 543-47 544-44 545-37 546-28 547-18 548-13 549- 9 550- 6 551- 4

HURDAT STORM 214, # STATIONS-MAX SURGE 49

155- 3 156-14 157-18 158-16 159-11 160-10 161- 8 162- 6 163- 4 164- 5 165- 7 166-11 167-18 168-29 169-38
170-25 171-17 172-14 173-11 174-10 175- 8 176- 7 177-10 178- 8 179- 7 500- 9 501- 9 502-11 503-11 504-13
505-13 506-15 507-17 508-21 509-51 510-76 511-48 512-27 513-48 514-12 515- 9 516- 9 517- 9 518-11 519-12
520-18 521-26 522-29 523-12

HURDAT STORM 215, # STATIONS-MAX SURGE 24

166- 3 167- 3 168- 5 169- 5 170- 9 171- 9 172- 7 173- 6 174- 5 175- 3 177- 4 501- 3 502- 4 503- 5 504- 6
505- 7 506- 8 507-10 508-11 509- 8 510- 4 511- 5 512- 4 513- 5

HURDAT STORM 217, # STATIONS-MAX SURGE 19

268- 6 269-10 270-16 271-12 272-11 273- 5 274- 5 275- 4 276- 3 406- 4 407- 5 408- 5 409- 6 410- 7 411-14
412-19 413-26 414-21 415- 6

HURDAT STORM 218, # STATIONS-MAX SURGE 43

110- 4 111-10 112-15 113-14 114-20 115-22 116-31 117-12 118-14 119-16 120-10 121-12 122- 9 123-12 124- 9
125- 7 126-10 127- 8 128- 7 129- 9 130- 8 131- 7 547-10 548-10 549-10 550-10 551-10 552-11 553-11 554-12
555-12 556-13 557-14 558-16 559-17 560-20 561-22 562-23 563-28 564-20 565-22 566-19 567- 9

HURDAT STORM 227, # STATIONS-MAX SURGE 40

174- 4 175- 6 176- 6 177-13 178-10 179- 8 180- 7 181- 7 182- 4 183- 5 184- 6 185- 4 186- 5 187- 3 188- 4
189- 4 190- 4 191- 4 192- 5 193- 5 485- 9 486- 7 487- 6 488- 5 489- 4 490- 4 491- 5 492- 5 493- 5 494- 6
495- 6 496- 7 497- 7 498- 8 499- 9 500-10 501-12 502-14 503- 8 504- 4

HURDAT STORM 231, # STATIONS-MAX SURGE 78

162- 3 163- 4 164- 4 165- 4 166- 4 167- 5 168- 6 169- 5 170- 6 171- 5 172- 5 173- 6 174- 7 175- 8 176- 8
 177-12 178-12 179-12 180-14 181-15 182- 9 183-10 184-12 185- 8 186- 9 187- 6 188- 8 189- 9 190- 9 191- 9
 192-13 193-13 194-13 195-14 196-10 197-12 198- 9 199-10 200- 8 201- 9 478-11 479-10 480-11 481-12 482-13
 483-15 484-18 485-22 486-19 487-16 488-12 489-11 490-10 491-11 492-10 493-10 494-12 495-14 496-15 497-15
 498-17 499-17 500- 5 501-13 502-12 503-11 504- 9 505- 7 506- 5 507- 5 508- 5 509- 4 510- 5 511- 7 512- 8
 513- 8 514- 4 515- 3

HURDAT STORM 232. # STATIONS-MAX SURGE 38

130- 3 131- 4 132- 5 133- 6 134- 9 135- 9 136- 9 137-11 138-11 139-12 140-13 141-15 142-17 143-20 144-24
 145-29 146-17 147-17 148-16 149-15 150-14 151-14 152-15 153-17 154-16 155-12 156- 8 157- 5 158- 3 513-10
 520- 3 521- 6 522- 9 523- 9 524-18 525-19 526-21 527-18 528-15 529-19 530-20 531-24 532-28 533-31 534-26
 535-22 536-21 537-20 538-17 539-14 540-12 541-11 542-11 543-10 544- 9 545- 8 546- 6 547- 4

HURDAT STORM 241. # STATIONS-MAX SURGE 17

153- 4 154- 8 155- 8 156- 6 157- 4 158- 4 509- 5 510- 7 511- 4 513- 4 521- 4 522- 7 523- 7 524-15 525-10
 526- 5 527- 3

HURDAT STORM 249. # STATIONS-MAX SURGE 71

202- 3 203-10 204-16 205-20 206-23 207-24 208-39 209-34 210-27 211-36 212-27 213-20 214-26 215-19 216-24
 217-18 218-13 219-17 220-10 221-14 222-14 223-16 225- 7 226- 5 227- 5 232- 4 233- 6 234-13 235-19 236-15
 237-11 238-12 239-10 240- 8 241- 8 242- 6 243- 6 244- 4 419- 5 420- 8 421- 8 422-10 423-11 424-12 425-14
 426-16 427-20 428-22 429-19 430- 8 431-16 432-19 433-20 440-21 441-19 442-22 443-27 444-32 445-34 446-38
 447-35 448-39 449-40 470-45 471-44 472-44 473-30 474-27 475-23 476-19 477- 9

HURDAT STORM 271. # STATIONS-MAX SURGE 64

194- 4 195- 6 196- 4 197- 6 198- 4 199- 7 200- 5 201- 8 202- 6 203- 4 204- 3 246- 4 247- 3 249- 5 250- 5
 251- 4 252- 3 253- 5 254-10 255-19 256-16 257-13 258-18 259-16 260-15 261-16 262-11 263-13 264- 9 265- 7
 266- 6 417- 9 418-10 419-13 420-18 421-18 422-22 423-23 424-21 425-23 426-22 427-23 428-22 429-18 430-10
 431- 7 432- 7 433- 9 434- 9 435- 8 436- 6 437- 4 474- 3 475- 5 476- 8 477-11 478-13 479- 8 480- 7 481- 8
 482- 9 483- 9 484- 9 485- 7

HURDAT STORM 276. # STATIONS-MAX SURGE 134

162- 3 163- 4 164- 3 169- 3 170- 4 171- 5 172- 6 173- 7 174- 8 175- 9 176- 8 177-17 178-13 179-10 180- 9
 181- 8 182- 5 183- 4 184- 5 185- 4 186- 5 187- 8 188-12 189-14 190-15 191-13 192-17 193-16 194-11 210- 5
 211-10 212-14 213-14 214-21 215-18 216-28 217-21 218-16 219-25 220-20 221-25 222-25 223-30 224-23 225-18
 226-13 227- 9 228- 5 233- 4 234- 4 235- 5 236- 6 237- 8 238- 9 239-10 240-10 241-10 242- 9 243- 8 244- 7
 245- 6 246- 5 247- 5 248- 4 249- 6 250- 5 251- 4 252- 4 253- 3 429- 6 430- 4 431- 5 432- 6 433- 8 434-10
 435-10 436- 8 437- 7 438- 6 439- 7 440- 8 441- 9 442-10 443-13 444-12 445-10 446- 6 447- 5 448- 4 449- 4
 452- 5 453-24 454- 5 455- 5 456- 5 457-31 458-33 459-34 460-34 461-25 462-29 463-32 464-33 465-27 466-23
 467-18 468-11 469- 7 485-18 486-20 487-19 488-17 489-17 490-16 491-12 492- 7 493- 4 494- 5 495- 5 496- 6
 497- 7 498- 9 499-11 500-13 501-15 502-20 503-19 504-17 505-13 506-10 507- 9 508- 8 509-12 510- 9

HURDAT STORM 289. # STATIONS-MAX SURGE 68

193- 5 194- 7 195-11 196- 7 197-11 198- 6 199-11 200- 7 201-12 202- 8 203- 6 204- 5 205- 4 208- 3 245- 4
 246- 3 249- 5 250- 4 251- 3 253- 4 254- 6 255-10 256- 8 257- 7 258- 9 259- 8 260- 8 261- 9 262- 6 263- 7
 385- 3 420- 9 421- 9 422-11 423-11 424-10 425-11 426-11 427-11 428-11 429-11 430- 7 431- 5 432- 6 433- 9
 434-10 435- 9 436- 7 437- 5 438- 4 466- 4 470- 3 471- 4 472- 4 473- 4 474- 5 475- 7 476-11 477-16 478-19
 479-13 480-12 481-13 482-15 483-16 484-17 485-13 486- 6

HURDAT STORM 292. # STATIONS-MAX SURGE 141

208- 3 217- 3 218- 4 219- 5 220- 6 221- 8 222- 8 223-10 224- 9 225- 7 226- 5 227- 4 228- 3 230- 4 233- 3
 234- 3 235- 4 236- 4 237- 5 238- 6 239- 6 240- 7 241- 7 242- 8 243-10 244-11 245-11 246-11 247- 9 248- 7
 249-11 250- 8 251- 6 252- 5 254- 5 255- 8 256- 7 257- 7 258- 9 259- 8 260-12 261-20 262-16 263-22 264-17
 265-15 266-14 267-17 268-10 269- 6 270-12 271-15 272-25 273-13 274-11 275-13 276-10 277- 8 278- 7 279- 4
 280- 4 291- 3 390- 4 391- 5 392- 5 393- 4 401- 4 402- 4 403- 4 404- 8 405-13 406-17 407-18 408-19 409-15
 410-20 411-33 412-24 413-17 414-17 415-19 416-26 417-25 418-27 419-28 420-34 421-28 422-30 423-19 424-12
 425-11 426-11 427-10 428- 9 429- 8 430- 4 431- 8 432- 9 433-14 434-19 435-21 436-18 437-14 438-11 439-11
 440- 9 441- 8 442- 7 443- 6 444- 6 445- 5 446- 5 447- 4 448- 4 449- 3 450- 3 452- 3 453- 3 454- 4
 457-11 458-10 459- 8 460- 5 461- 4 462- 4 463- 4 465- 3 466- 3 470- 3 471- 4 472- 4 474- 4 475- 5 476- 7
 477- 6 478- 5 478- 8 479- 3 480- 3 481- 7

MURDAT STORM 295, # STATIONS-MAX SURGE 36

123- 6 124- 6 125- 5 126-10 127- 7 128- 6 129- 8 130- 6 131- 5 132- 6 133- 5 134- 6 135- 4 136- 4 137- 4
138- 4 139- 3 538- 3 539- 4 540- 4 541- 5 542- 5 543- 5 544- 6 545- 6 546- 7 547- 7 548- 7 549- 8 550- 9
551-10 552-12 553-12 554-10 555- 6 556- 4

MURDAT STORM 296, # STATIONS-MAX SURGE 156

184- 3 185- 3 186- 7 187- 6 188-11 189-19 190-23 191-23 192-35 193-31 194-28 195-25 196-18 197-13 198- 8
199- 3 206- 8 207- 9 208- 8 209-11 210-10 211-10 212-11 213-11 214-14 215-16 216-21 217-19 218-18 219-28
220-19 221-21 222-21 223-23 224-15 225-14 226-15 227-15 228- 9 233- 5 234- 5 235- 5 236- 7 237- 9 238- 7
239- 7 240- 6 241- 5 242- 5 243- 5 244- 4 245- 4 246- 3 249- 4 250- 4 265- 4 266- 5 267- 8 268- 5 269- 3
270- 5 271- 7 272- 9 273- 4 274- 3 275- 4 276- 3 304- 3 305- 6 306- 4 373- 5 374- 6 375- 8 376- 8 377- 4
380- 3 382- 5 383- 4 384- 4 385- 3 389- 4 390- 4 391- 3 404- 3 405- 5 406- 7 407- 6 408- 6 409- 4 410- 6
411-14 412-12 413- 8 414- 8 415-10 416-12 417-10 418- 9 419- 6 420- 5 432- 4 433- 6 434- 6 435- 6 436- 5
437- 4 438- 4 439- 4 440- 5 441- 5 442- 6 443- 8 444-11 445-11 446-10 447- 8 448- 6 449- 5 450- 3 452- 8
453-17 454-10 455- 9 456-11 457-19 458-28 459-33 460-39 461-25 462-23 463-21 464-20 465-13 466- 9 467-10
468-10 469-13 470-11 471- 7 472-10 473- 8 481- 5 482-11 483-15 484-25 485-45 486-46 487-45 488-33 489-30
490-21 491-13 492- 9 493- 9 494- 6 495- 4

MURDAT STORM 299, # STATIONS-MAX SURGE 125

186- 3 187- 4 188- 4 189- 4 203- 6 204-12 205-16 206-18 207-22 208-33 209-30 210-24 211-30 212-23 213-19
214-22 215-17 216-20 217-16 218-13 219-15 220-11 221-12 222-12 223-13 225- 8 226- 8 227- 8 229- 3 233- 4
234- 4 235- 3 236- 3 254- 8 255-12 256-13 257-12 258-16 259-13 260-12 261-12 262- 9 263-10 264- 8 265- 7
266- 6 267- 6 268- 5 269- 6 270- 8 271- 6 272- 3 273- 6 274- 7 275- 6 276- 5 277- 4 278- 4 279- 4 280- 5
281- 4 401- 4 402- 5 403- 5 404- 5 405- 4 406- 5 407- 6 408- 6 409- 9 410- 6 411- 6 412- 8 413- 9 414- 7
415- 6 416- 6 417- 7 418- 7 419- 9 420-11 421-12 422-13 423-16 424-16 425-19 426-19 427-19 428-15 429- 9
447- 4 448- 4 449- 4 450- 4 451- 4 452- 3 457-12 458-15 459-17 460-19 461-16 462-18 463-21 464-26 465-27
466-30 467-29 468-32 469-34 470-38 471-37 472-36 473-25 474-23 475-17 476-13 490- 4 491- 4 492- 4 493- 3
682- 5 683- 6 684- 4 685- 4 686- 5

MURDAT STORM 310, # STATIONS-MAX SURGE 52

128- 4 129- 5 130- 9 131-13 132-19 133-27 134-47 135-48 136-45 137-62 138-53 139-46 140-38 141-32 142-28
143-24 144-22 145-22 146-16 147-15 148-13 149-10 150- 9 151- 9 152- 9 153-10 154-10 525-11 526-12 527-11
528- 9 529-11 530-14 531-17 532-20 533-24 534-23 535-26 536-32 537-39 538-47 539-54 540-60 541-67 542-66
543-60 544-48 545-33 546-19 547-12 548- 7 549- 5

MURDAT STORM 324, # STATIONS-MAX SURGE 133

106- 3 107- 4 108- 5 109- 8 110-10 111-12 112-10 113- 8 114-10 115- 9 116- 7 117- 6 118- 6 119- 6 120- 5
121- 6 122- 5 123- 5 124- 5 125- 4 126- 5 127- 5 128- 5 129- 6 130- 6 131- 5 132- 6 133- 6 134- 8 135- 6
136- 6 137- 6 138- 5 139- 5 140- 5 141- 3 153- 4 154- 5 155- 5 156- 5 157- 4 166- 3 167- 5 168- 6 169- 6
170- 5 171- 4 172- 3 173- 3 174- 3 177- 3 209- 3 210- 3 211- 6 212- 4 213- 4 214- 5 215- 4 216- 5 217- 3
255- 3 258- 3 425- 4 426- 4 427- 4 428- 4 429- 3 434- 4 435- 6 436- 5 460- 3 461- 3 462- 4 463- 6 464- 7
465- 8 466- 9 467- 7 468- 6 469- 6 470- 4 502- 3 503- 4 504- 4 505- 4 506- 4 507- 4 508- 4 509- 5 510- 7
511- 8 512- 8 513-10 514- 4 522- 5 523- 5 524- 5 525- 5 538- 3 539- 5 540- 5 541- 6 542- 7 543- 7 544- 8
545- 7 546- 6 547- 6 548- 6 549- 6 550- 6 551- 6 552- 5 553- 5 554- 5 555- 5 556- 5 557- 6 558- 6 559- 6
560- 7 561- 7 562- 8 563-10 564-12 565-11 566-14 567-16 568-12 569- 9 570- 6 571- 5 572- 3

MURDAT STORM 327, # STATIONS-MAX SURGE 51

283- 3 284- 5 285- 9 286-11 287-12 288-18 289-23 290-23 291-24 292-16 293-17 294-11 295- 7 296- 8 297- 9
298- 9 299- 5 300- 4 301- 4 302- 4 303- 4 304- 4 305- 5 306- 4 374- 4 375- 5 376- 5 377- 5 378- 5 379- 5
380- 6 381- 5 382- 7 383- 6 384- 7 385-10 386- 9 387-12 388-10 389-18 390-21 391-29 392-30 393-30 394-25
395-23 396-21 397-15 398-13 399- 7 400- 3

MURDAT STORM 331, # STATIONS-MAX SURGE 111

191- 3 193- 5 194-10 195-20 196-15 197-26 198-18 199-31 200-22 201-32 202-21 203-18 204-15 205-13 206-10
207- 8 208-15 209-10 210- 8 211-13 212-10 213- 8 214-12 215- 9 216-12 217- 9 218- 8 219-10 220- 9 221-10
222-10 223-12 224- 8 225- 8 226- 6 227- 5 241- 3 242- 4 243- 6 244- 8 245- 8 246- 7 247- 6 248- 5 249- 9
250- 7 251- 5 252- 4 253- 5 254- 9 255-15 256-10 257- 8 258-11 259-10 260- 4 261- 5 262- 4 263- 5 420- 8
421- 6 422- 8 423- 7 424-13 425-13 426-13 427-13 428-17 429-16 430-10 431- 8 432-10 433-14 434-17 435-17
436-14 437-10 438- 8 439- 8 440- 5 441- 4 453- 8 457-11 458-13 459-13 460-13 461-11 462-12 463-15 464-16

465-18 466-19 467-15 468-15 469-13 470-15 471-18 472-19 473-15 474-19 475-22 476-25 477-30 478-44 479-36
480-36 481-35 482-35 483-33 484-27 485-11

HURDAT STORM 332, 8 STATIONS-MAX SURGE 127

279- 9 280-16 281-13 282-12 283- 6 284- 6 285-10 286-10 287-11 288-18 289-20 290-18 291-15 292-11 293-10
294- 9 295- 8 296- 8 297-11 298-10 299- 7 300- 7 301- 7 302- 8 303- 8 304- 6 305- 6 306- 5 307- 5 308- 5
309- 5 310- 5 311- 5 312- 5 313- 6 314- 5 315- 5 316- 5 317- 5 318- 6 319- 6 320- 8 321- 8 322- 6 323- 6
324- 5 325- 6 326- 5 327- 5 328- 5 329- 5 330- 5 331- 5 332- 5 333- 4 334- 4 335- 4 336- 4 337- 4 338- 4
339- 4 340- 4 341- 4 342- 4 343- 4 344- 4 345- 4 346- 5 347- 4 348- 4 349- 4 350- 5 351- 5 352- 5 353- 5
354- 5 355- 5 356- 6 357- 5 358- 6 359- 7 360- 8 361- 8 362- 6 363- 6 364- 5 365- 3 366- 5 367- 6 368- 5
369- 5 370- 5 371- 5 372- 5 373- 5 374- 5 375- 6 376- 6 377- 7 378- 8 379- 9 380- 8 381- 9 382- 8 383- 8
384- 8 385-10 386- 9 387- 9 388-11 389-10 390-11 391-15 392-16 393-21 394-21 395-21 396-18 397-17 398-14
399-12 400-16 401-19 402-19 403-19 404-10 409- 3

HURDAT STORM 333, 8 STATIONS-MAX SURGE 220

192- 4 193-11 194-20 195-38 196-33 197-58 198-43 199-71 200-44 201-43 202-27 203-29 204-32 205-35 206-38
207-32 208-38 209-36 210-33 211-45 212-40 213-35 214-45 215-42 216-52 217-45 218-39 219-52 220-38 221-41
222-41 223-37 224-25 225-26 226-30 227-37 228-21 229- 4 233- 9 234-11 235-13 236-16 237-16 238-12 239-11
240-10 241- 9 242- 8 243- 8 244- 7 245- 6 246- 6 247- 5 248- 5 249- 7 250- 7 251- 6 252- 4 253- 4 254- 6
255- 7 256- 8 257- 8 258-12 259-14 260-18 261-24 262-19 263-25 264-21 265-19 266-18 267-22 268-14 269- 9
270-15 271-16 272-24 273-11 274-11 275-13 276-10 277- 9 278-11 279- 6 280- 6 281- 4 282- 4 288- 6 289-16
290-25 291-32 292-29 293-29 294-20 295-13 296-12 297-13 298-11 299- 6 300- 5 301- 4 302- 5 303- 5 304- 3
305- 4 306- 4 307- 3 308- 3 309- 3 310- 3 311- 3 312- 3 313- 4 314- 4 315- 4 316- 4 317- 4 318- 5 319- 5 320- 5
321- 6 322- 6 323- 6 324- 8 325-12 326-13 327-17 328-13 329-25 330-31 331-41 332-39 333-31 334-18 335- 7
336- 6 337- 7 338- 8 339-13 340-13 341-13 342-13 343-11 344-12 345-11 346- 9 347- 8 348- 7 349- 7 350- 8 351- 9 352-10 353-13 354-18
355-18 356-22 357-17 358-15 359-12 360- 8 361- 5 362-16 363-28 364-21 365-21 366-26 367-33 368-50 369-60
370-67 371-52 372-53 373-56 374-59 375-53 376-54 377-51 378-48 379-45 380-42 381-34 382-50 383-45 384-35
385-28 386- 8 387-43 388-72 389-72 390-79 391-78 392-77 393-71 394-55 395-15

HURDAT STORM 357, 8 STATIONS-MAX SURGE 135

168- 3 169- 3 170- 3 171- 4 172- 3 173- 3 174- 4 175- 4 176- 4 177- 4 178- 4 179- 4 180- 4 181- 4 182- 4 183- 4 184- 5 185- 4 186- 5 187- 5 188- 6
189- 6 190- 6 191- 6 192- 6 193- 6 194- 6 195- 5 196- 4 197- 5 198- 5 199- 5 200- 5 201- 5 202- 4 203- 4
204- 3 205- 4 206- 6 207- 5 208- 7 209- 6 210- 4 211- 6 212- 4 214- 4 220- 8 221- 8 222- 8 223-12 224-16
225-14 226-12 227- 9 228-10 236- 3 237- 4 238- 4 239- 5 240- 6 241- 6 242- 6 243- 6 244- 6 245- 5 246- 4
247- 4 248- 3 249- 5 250- 4 251- 3 274- 3 409- 3 431- 4 432- 5 433- 6 434- 7 435- 7 436- 7 437- 6 438- 5
439- 6 440- 6 441- 6 442- 6 443- 6 444- 5 445- 4 446- 3 447- 3 452- 8 453-16 454- 5 455- 8 456-11 457-15
458- 6 466- 6 467- 6 468- 6 469- 7 470- 7 471- 7 472- 8 473- 7 474- 4 475- 3 478- 5 479- 5 480- 5 481- 5
482- 5 483- 5 484- 5 485- 7 486- 7 487- 7 488- 7 489- 7 490- 7 491- 6 492- 5 493- 5 494- 5 495- 5 496- 5
497- 4 499- 4 499- 4 500- 4 501- 4 502- 4 503- 4 504- 4 505- 3 506- 3 508- 3 509- 3 511- 4 512- 3 513- 4

HURDAT STORM 362, 8 STATIONS-MAX SURGE 77

179- 4 180- 6 181- 8 182- 4 183- 6 184- 8 185- 5 186- 6 187- 6 188- 9 189-12 190-12 191-11 192-14 193-12
194-11 195-11 196- 8 197- 7 198- 5 211- 3 212- 4 213- 4 214- 7 215- 6 216- 9 217- 7 218- 6 219-10 220- 6
221- 7 222- 7 223- 6 224- 4 225- 3 226- 4 227- 3 443- 3 444- 4 445- 4 446- 4 453- 4 456- 3 457- 6 458- 9
459-13 460-14 461- 9 462- 9 463-10 464-11 465- 8 466- 6 467- 5 468- 3 469- 3 481- 4 482- 6 483- 8 484-11
485-14 486-16 487-16 488-14 489-15 490-14 491-11 492- 7 493- 7 494- 8 495- 9 496-10 497- 9 498-10 499- 8
500- 6 501- 3

HURDAT STORM 370, 8 STATIONS-MAX SURGE 110

284- 5 285- 7 286- 8 287- 9 288-13 289-14 290-13 291-13 292-11 293-10 294-10 295- 8 296- 8 297-10 298- 9
299- 6 300- 5 301- 6 302- 6 303- 7 304- 5 305- 5 306- 5 307- 5 308- 5 309- 6 310- 6 311- 7 312- 7 313- 7
314- 7 315- 8 316- 9 317-10 318-11 319-11 320- 8 321- 8 322- 8 323- 6 324- 5 325- 5 326- 4 327- 4 328- 4
329- 4 330- 4 331- 4 332- 4 333- 4 334- 3 339- 3 340- 4 341- 4 342- 3 345- 3 346- 4 347- 3 348- 4 349- 4
350- 4 351- 4 352- 4 353- 4 354- 4 355- 4 356- 5 357- 5 358- 7 359-10 360-13 361-13 362-13 363-12 364- 9
365- 6 366- 9 367- 9 368- 8 369- 7 370- 7 371- 7 372- 6 373- 5 374- 5 375- 6 376- 5 377- 6 378- 7 379- 7
380- 6 381- 7 382- 6 383- 6 384- 7 385- 9 386- 9 387-10 388-10 389-11 390-11 391-12 392-13 393-15 394-15
395-15 396-14 397-11 398-10 399- 5

HURDAT STORM 386, # STATIONS-MAX SURGE 110

280- 3 281- 3 284- 3 285- 4 286- 4 287- 4 288- 5 289- 6 290- 6 291- 6 292- 5 293- 5 294- 5 295- 5 296- 6
 297- 8 298- 7 299- 8 300- 9 301-12 302-17 303-20 304-19 305-18 306-24 307-27 308-29 309-28 310-36 311-28
 312-23 313-23 314-20 315-24 316-22 317-21 318-17 319-15 320- 8 321- 5 322- 4 323- 4 324- 5 325- 5 326- 6
 327- 6 328- 7 329- 7 330- 8 331- 7 332- 5 333- 5 347- 6 348- 6 349- 6 350- 8 351- 8 352- 8 353- 7 354- 9
 355- 7 356- 5 357- 4 358- 4 359- 6 360-10 361- 8 362-14 363-19 364-31 365-31 366-33 367-30 368-36 369-29
 370-34 371-39 372-43 373-43 374-36 375-29 376-19 377-18 378-20 379-16 380-12 381-14 382-12 383-11 384- 8
 385- 8 386- 6 387- 5 388- 8 389- 5 390- 5 391- 5 392- 6 393- 6 394- 6 395- 6 396- 6 397- 5 398- 5 399- 4
 400- 3 401- 3 402- 4 403- 4 404- 3

HURDAT STORM 397, # STATIONS-MAX SURGE 103

138- 5 139-11 140-16 141-18 142-20 143-22 144-25 145-21 146-14 147-13 148-10 149- 6 150-10 151-10 152-10
 153-12 154-13 155- 9 156- 7 157- 6 158- 5 159- 4 160- 3 166- 4 167- 6 168- 7 169- 7 170- 6 171- 4 172- 4
 173- 3 174- 3 177- 3 203- 4 204- 5 205- 5 206- 3 208- 3 253- 6 256- 7 257- 7 258-10 259- 8 260- 8 261- 7
 262- 5 263- 5 419- 3 420- 6 421- 7 422- 8 423-10 424-10 425-12 426-12 427-10 428- 6 429- 3 471- 4 472- 4
 473- 4 474- 6 475- 7 476- 8 477- 4 502- 3 503- 3 504- 4 505- 3 506- 4 507- 4 508- 5 509- 6 510- 9 511-10
 512- 9 513-11 514- 5 515- 4 516- 3 517- 3 518- 4 519- 4 520- 4 521- 5 522- 8 523- 7 524-13 525-14 526-14
 527-10 528- 4 530- 3 531-10 532-13 533-23 534-26 535-26 536-29 537-34 538-26 539-15 540- 5

HURDAT STORM 398, # STATIONS-MAX SURGE 16

264- 5 265- 9 266-13 267-20 268-17 269-11 270-14 271-10 412-15 413-21 414-18 415-26 416-26 417-21 418-16
 419- 6

HURDAT STORM 405, # STATIONS-MAX SURGE 45

124- 4 125- 6 126- 7 127-11 128-13 129-19 130-19 131-16 132-26 133-21 134-33 135-25 136-20 137-27 138-22
 139-19 140-16 141-13 142-12 143-10 144-10 145-10 146- 6 532-10 533-11 534-10 535-12 536-15 537-18 538-21
 539-23 540-25 541-29 542-31 543-33 544-36 545-34 546-32 547-27 548-25 549-20 550-15 551-11 552- 5 553- 4

HURDAT STORM 432, # STATIONS-MAX SURGE 30

270- 3 271- 4 272- 5 273- 8 274- 8 275- 8 276- 5 277- 4 278- 3 300- 3 302- 3 303- 4 376- 3 377- 3 378- 4
 379- 4 380- 5 381- 4 382- 6 383- 4 384- 4 405- 5 406- 7 407- 8 408-10 409-11 410-12 411- 5 412- 4 413- 3

HURDAT STORM 436, # STATIONS-MAX SURGE 137

270- 3 271- 3 273- 4 274- 5 275- 4 276- 4 277- 3 278- 3 279- 5 280- 7 281- 9 282-10 283- 8 284- 8 285-13
 286-13 287-14 288-20 289-20 290-19 291-17 292-15 293-14 294-13 295-13 296-13 297-16 298-16 299-15 300-16
 301-18 302-21 303-23 304-19 305-19 306-21 307-20 308-20 309-19 310-22 311-20 312-16 313-17 314-14 315-18
 316-15 317-13 318-11 319- 9 320- 5 324- 4 325- 4 326- 6 327- 8 328-10 329-10 330-12 331-12 332- 8 333- 9
 334- 7 335- 8 336-11 337- 8 338- 6 339- 8 340-10 341-12 342-11 343-10 344-11 345-15 346-14 347-11 348-11
 349-10 350-12 351-12 352-12 353-12 354-14 355- 8 356- 5 357- 3 359- 5 360- 6 361- 5 362-14 363-18 364-26
 365-28 366-29 367-27 368-33 369-22 370-25 371-25 372-24 373-25 374-22 375-21 376-18 377-21 378-23 379-22
 380-19 381-21 382-17 383-16 384-15 385-16 386-13 387-13 388-17 389-13 390-15 391-16 392-17 393-20 394-20
 395-21 396-22 397-18 398-19 399-12 400-11 401-12 402-10 403- 7 404- 5 406- 4 407- 4 408- 4 409- 6 410- 3
 412- 3 413- 4

HURDAT STORM 440, # STATIONS-MAX SURGE 135

201- 5 202- 4 203- 4 204- 6 205- 8 206- 7 207- 7 208-12 209-11 210-10 211-17 212-15 213-12 214-20 215-16
 216-23 217-17 218-13 219-17 220- 9 221-14 222-14 223-16 224- 7 225- 6 226- 3 227- 5 254- 5 255- 8 256- 8
 257- 9 258-15 259-16 260-18 261-22 262-17 263-22 264-19 265-15 266-12 267-13 268- 7 269- 4 270- 6 271- 6
 272- 9 273- 4 275- 4 276- 3 292- 4 293- 5 294- 4 296- 3 297- 4 298- 4 313- 3 314- 3 315- 4 316- 4 317- 5
 318- 5 319- 6 322- 3 339- 5 360- 5 361- 5 362- 8 363- 7 364- 5 365- 5 366- 5 367- 4 368- 4 382- 3 384- 3
 385- 5 386- 4 387- 5 388- 4 389- 7 390- 6 391- 5 392- 4 405- 5 406- 7 407- 6 408- 6 409- 4 410- 6 411-14
 412-11 413- 9 414-10 415-15 416-20 417-21 418-25 419-28 420-30 421-27 422-29 423-26 424-21 425-19 426-16
 427-13 428-10 429- 9 430- 4 433- 3 434- 3 453- 8 457-15 458-19 459-21 460-22 461-19 462-22 463-27 464-30
 465-29 466-30 467-22 468-19 469-16 470-16 471-14 472-14 473-10 474-11 475-10 476-10 477-10 478- 8 479- 3

HURDAT STORM 445, # STATIONS-MAX SURGE 71

108- 3 109- 4 110- 4 111- 5 112- 5 113- 4 114- 5 115- 6 116- 6 117- 5 118- 6 119- 7 120- 6 121- 8 122- 8
 123-10 124-11 125- 9 126-17 127-10 128- 6 129-11 130- 6 131- 4 132- 9 133- 7 134-12 135-10 136- 8 137-12
 138-10 139- 9 140- 8 141- 7 142- 6 143- 5 535- 6 536- 8 537- 9 538-10 539-11 540-12 541-13 542-13 543-13
 544-13 545-12 546-12 547- 9 548-10 549-13 550-15 551-17 552-21 553-17 554-13 555-11 556- 9 557- 8 558- 8

339- 7 360- 7 361- 6 362- 6 363- 6 364- 5 365- 5 366- 6 367- 6 368- 5 369- 5

HURDAT STORM 449, 8 STATIONS-MAX SURGE 62

216- 3 219- 4 220- 4 221- 5 222- 5 223- 6 224- 4 225- 4 228- 5 239- 4 235- 4 236- 4 237- 5 238- 8 239- 9
260-11 261-14 262-12 263-15 264-12 265-11 266-10 267-11 268- 6 270- 4 271- 4 272- 4 411- 6 412- 6 413- 7
414- 7 415-11 416-17 417-18 418-19 419-19 420-21 421-18 422-18 423-16 424-13 425-11 426- 9 427- 7 428- 5
429- 4 443- 5 444- 8 445- 5 453- 4 457- 6 458- 7 459- 6 460- 5 461- 4 462- 4 463- 5 464- 4 465- 4 466- 4
476- 3 477- 3

HURDAT STORM 456, 8 STATIONS-MAX SURGE 108

194- 3 195- 4 196- 4 197- 5 198- 4 199- 7 200- 6 201-11 202- 8 203- 6 204- 7 205- 8 206- 8 207- 7 208-12
209-10 210- 8 211-13 212-11 213- 9 214-14 215-10 216-14 217-10 218- 7 219- 9 220- 5 221- 7 222- 7 223- 8
224- 4 225- 3 226- 3 225- 3 226- 3 227- 4 228- 6 229- 8 260-10 261-13 262-10 263-13 264-10 265- 8 266- 7
267- 7 268- 4 272- 3 289- 4 290- 5 291- 5 292- 3 390- 3 391- 5 392- 6 393- 7 394- 4 405- 4 406- 5 407- 3
411- 6 412- 4 413- 5 414- 5 415- 8 416-11 417-12 418-15 419-16 420-20 421-17 422-20 423-15 424-11 425- 8
426- 7 427- 5 428- 4 429- 4 433- 4 457- 8 458-10 459-11 460-12 461-11 462-12 463-15 464-18 465-19 466-20
467-16 468-14 469-13 470-14 471-14 472-15 473-11 474-11 475-11 476-12 477-15 478-17 479-10 480- 8 481- 6
482- 6 483- 6 484- 5

HURDAT STORM 461, 8 STATIONS-MAX SURGE 115

163- 3 164- 4 165- 5 166- 6 167- 7 168-10 169-15 170-16 171-16 172-14 173-12 174-10 175- 8 176- 6 177- 9
178- 6 179- 5 180- 5 181- 5 182- 4 183- 4 184- 4 185- 4 186- 4 187- 5 188- 7 189- 9 190- 9 191- 7 192-11
193- 7 211- 4 212- 6 213- 8 214-12 215-14 216-18 217-18 218-20 219-33 220-27 221-32 222-32 223-34 224-23
225-22 226-20 227-17 228- 7 242- 5 243- 7 244- 4 245- 3 433- 3 434- 4 435- 4 436- 4 437- 4 438- 3 439- 4
440- 7 441- 5 452- 4 453-23 454- 6 455- 7 456- 7 457-32 458-38 459-43 460-46 461-27 462-23 463-18 464-18
465-11 466- 4 467- 7 468- 4 485- 4 486- 8 487-13 488-11 489-11 490-10 491- 8 492- 6 493- 4 494- 4 495- 5
496- 5 497- 5 498- 5 499- 6 500- 6 501- 7 502-10 503-12 504-14 505-14 506-15 507-18 508-20 509-25 510-33
511-12 512-11 513- 9 514- 5 515- 4 516- 3 520- 3 521- 3 524- 3 528- 3

HURDAT STORM 463, 8 STATIONS-MAX SURGE 116

194- 3 195- 5 196- 4 197- 8 198- 7 199-13 200-11 201-21 202-17 203-16 204-17 205-18 206-18 207-15 208-23
209-19 210-16 211-22 212-18 213-15 214-18 215-15 216-18 217-14 218-10 219-12 220- 7 221- 7 222- 7 223- 7
224- 3 226- 3 227- 5 226- 3 227- 4 228- 8 229-10 260-13 261-20 262-16 263-21 264-17 265-15 266-13 267-13
268- 7 269- 4 270- 6 271- 6 272- 8 273- 3 275- 3 290- 4 291- 5 292- 5 293- 4 389- 3 390- 5 391- 6 392- 7
393- 5 404- 3 405- 6 406- 7 407- 5 408- 5 409- 3 410- 5 411-13 412-10 413- 9 414- 9 415-13 416-20 417-22
418-27 419-27 420-32 421-27 422-29 423-20 424-14 425-10 426- 8 427- 5 428- 3 433- 4 457- 7 458-11 459-13
460-16 461-14 462-16 463-19 464-22 465-22 466-24 467-22 468-23 469-23 470-24 471-25 472-30 473-24 474-23
475-23 476-25 477-30 478-32 479-18 480-14 481-11 482-10 483- 8 484- 7 485- 3

HURDAT STORM 465, 8 STATIONS-MAX SURGE 40

255- 3 256- 3 261- 4 262- 6 263-10 264-13 265-15 266-17 267-19 268-15 269-11 270-14 271-11 272- 9 273- 7
274- 7 275- 6 276- 4 277- 3 406- 4 407- 5 408- 6 409- 8 410- 7 411-10 412-14 413-19 414-16 415-21 416-22
417-25 418-25 419-20 420-11 421- 6 422- 3 428- 3 453- 3 454- 4 455- 4

HURDAT STORM 471, 8 STATIONS-MAX SURGE 20

154- 4 155- 6 156- 6 157- 4 168- 5 169- 9 170- 6 171- 4 506- 3 507- 4 508- 5 509-17 510-25 511- 8 513- 6
521- 7 522- 9 523- 8 524- 6 525- 4

HURDAT STORM 473, 8 STATIONS-MAX SURGE 40

219- 3 220- 3 221- 8 222- 8 223-17 224-11 225- 5 241- 3 242- 4 243- 4 244- 5 245- 5 246- 5 247- 5 248- 4
249- 5 250- 4 429- 3 432- 4 433- 5 434- 8 435-10 436- 8 437- 7 438- 5 439- 5 440- 4 441- 4 442- 3 450- 5
451- 3 452- 6 453-12 454- 9 455-11 456- 9 457-18 458-17 459-11 460- 5

HURDAT STORM 474, 8 STATIONS-MAX SURGE 9

233- 3 443- 3 444- 4 448- 3 449- 4 450- 4 454- 5 455- 4 456- 4

HURDAT STORM 477, 8 STATIONS-MAX SURGE 85

194- 4 195- 5 196- 4 197- 7 198- 6 199-10 200- 7 201-14 202-10 203- 7 204- 5 205- 6 206- 5 207- 4 208- 7
209- 5 210- 4 211- 6 212- 4 213- 3 214- 4 243- 4 244- 6 245- 5 246- 3 254- 5 255- 8 256- 7 257- 7 258- 7
259- 6 260- 6 261- 7 262- 5 263- 7 264- 4 346- 4 365- 4 375- 4 376- 4 416- 4 417- 4 418- 5 419- 6 420- 9

421- 9 422-10 423- 9 424- 7 425- 8 426- 9 427-10 428- 9 429- 8 430- 4 433- 4 434- 6 435- 7 436- 6 437- 6
 438- 5 439- 6 440- 3 444- 4 445- 6 446- 8 447- 6 448- 7 449- 6 470- 8 471- 9 472- 9 473- 7 474- 9 475- 8
 476-11 477-16 478-22 479-13 480-11 481- 9 482- 8 483- 7 484- 6 485- 4

MURDAT STORM 490, # STATIONS-MAX SURGE 24

170- 3 171- 3 172- 4 173- 5 174- 5 175- 4 176- 3 177- 7 178- 4 179- 3 494- 3 495- 3 496- 3 498- 3 499- 4
 500- 4 501- 5 502- 8 503- 9 504-12 505-11 506- 6 507- 4 508- 3

MURDAT STORM 493, # STATIONS-MAX SURGE 70

200- 4 201-11 202-18 203- 3 204- 9 205-13 206-16 207- 5 208- 6 209- 5 210- 4 211- 7 212- 5 213- 3 214- 4
 215- 3 216- 5 228- 4 229- 5 233- 3 234- 8 235-14 236-13 237-13 238-20 239-19 240-19 241-21 242-13 243-16
 244-11 245- 8 246- 7 247- 6 416- 8 417-10 418-12 419-15 420-23 421-23 422-29 423-29 424-26 425-26 426-22
 427-20 428-17 429-13 430- 5 430- 4 431- 5 434- 4 440- 3 442- 4 443- 5 444- 7 445- 5 446- 5 447- 6 448- 7
 449- 7 470- 6 471- 6 472-25 473-21 474-18 475-16 476-12 477-26 478-16

MURDAT STORM 499, # STATIONS-MAX SURGE 44

195- 3 197- 3 201- 4 238- 3 239- 3 253- 5 256- 5 257- 5 258- 7 259- 8 260- 8 261-10 262- 7 263- 8 264- 6
 265- 4 266- 3 417- 5 418- 6 419- 8 420-11 421-11 422-14 423-12 424-10 425-10 426- 9 427- 8 428- 7 429- 6
 433- 3 434- 4 435- 3 443- 4 476- 3 477- 5 478- 6 479- 4 480- 3 481- 3 482- 4 483- 4 484- 4 485- 4

MURDAT STORM 520, # STATIONS-MAX SURGE 14

280- 4 281- 4 282- 3 288- 4 289- 3 394- 3 395- 4 396- 4 397- 4 400- 4 401- 6 402- 5 403- 5 404- 3

MURDAT STORM 521, # STATIONS-MAX SURGE 60

213- 5 214- 5 215- 8 216-11 217-13 218-13 219-19 220-18 221-25 222-25 223-32 224-25 225-20 226-15 227-11
 228- 5 229- 3 239- 3 240- 3 241- 3 242- 4 243- 7 244- 9 245-10 246-12 247-12 248- 7 249- 4 270- 6 271- 5
 272- 4 411- 5 412- 6 413- 9 414- 8 415-11 416-15 417-18 418-16 419-11 420- 5 421- 4 422- 3 423- 3 424- 3
 425- 3 426- 3 433-25 434- 5 435- 6 436- 6 437-32 438-33 439-31 440-28 441-19 442-18 443-13 444- 9 445- 4

MURDAT STORM 522, # STATIONS-MAX SURGE 49

317- 3 318- 3 319- 3 320- 4 321- 5 322- 5 323- 4 324- 4 325- 5 326- 5 327- 5 328- 5 329- 5 330- 5 331- 5
 332- 5 333- 5 334- 5 335- 5 336- 6 337- 5 338- 6 339- 6 340- 6 341- 6 342- 6 343- 6 344- 6 345- 6 346- 6
 347- 5 348- 5 349- 5 350- 5 351- 5 352- 5 353- 5 354- 5 355- 5 356- 5 357- 4 358- 4 359- 5 360- 4 361- 5
 362- 4 363- 4 367- 3 368- 3

MURDAT STORM 526, # STATIONS-MAX SURGE 91

178- 3 179- 4 180- 6 181- 8 182- 4 183- 6 184- 6 185- 4 186- 5 188- 3 189- 3 190- 3 191- 4 192- 5 193- 6
 194- 8 195-11 196- 7 197- 9 198- 6 199- 8 200- 6 201- 8 202- 6 203- 4 204- 7 205- 9 206-11 207-15
 208-13 209- 9 210-12 211-12 212-12 213- 9 214-10 215-10 216- 9 217- 8 218- 8 219- 6 220- 6 221- 4 222- 4
 402- 5 403- 6 404- 8 405-10 406-11 407-11 408-11 409-11 410-11 411-13 412-15 413-16 414-16 415-18 416-18
 417-16 418-16 419-11 420- 7 421- 3 476- 6 477- 8 478-11 479- 9 480- 9 481-10 482-12 483-13 484-16 485-17
 486-10 487- 6 488- 4 489- 4 490- 4 491- 4 492- 4 493- 5 494- 6 495- 7 496- 9 497- 9 498- 9 499- 7 500- 5
 501- 3

MURDAT STORM 530, # STATIONS-MAX SURGE 28

212- 4 213- 4 214- 6 215- 4 216- 8 217- 5 218- 3 219- 5 220- 4 221- 5 222- 5 223- 5 224- 4 225- 4 249- 3
 433- 3 434- 5 435- 4 437- 5 438- 6 439- 6 440- 6 441- 6 442- 7 443-10 444-11 445-10 446- 5

MURDAT STORM 535, # STATIONS-MAX SURGE 60

282- 3 283- 4 285- 4 286- 5 287- 3 303- 3 304- 3 305- 4 306- 4 307- 5 308- 5 309- 6 310-10 311- 7 312- 5
 313- 5 314- 4 315- 6 316- 6 317- 5 318- 4 319- 4 320- 3 321- 4 322- 5 323- 5 324- 3 325- 3 326- 4 327- 3
 348- 4 349- 4 350- 5 351- 5 352- 5 353- 3 354- 4 362- 6 363- 7 364-11 365-12 366-12 367-10 368-13 369- 8
 370- 9 371-11 372-12 373- 6 374- 4 375- 4 376- 4 377- 3 378- 3 379- 3 386- 3 397- 4 398- 3 399- 5 400- 6

MURDAT STORM 541, # STATIONS-MAX SURGE 80

264- 3 265- 5 266- 6 267- 6 268- 6 269-20 270-25 271-33 272-44 273-39 274-40 275-39 276-30 277-24 278-22
 279-12 280- 9 281- 5 282- 4 288- 3 289- 4 290- 5 291- 5 292- 4 293- 6 294- 4 295- 3 296- 4 297- 5 298- 5
 299- 5 300- 4 301- 4 302- 5 303- 5 304- 5 305- 8 376- 9 377- 6 378- 6 379- 5 380- 6 381- 6 382- 7 383- 6
 384- 7 385- 6 386- 5 387- 5 388- 5 389- 7 390- 7 391- 6 392- 5 393- 5 394- 5 395- 4 396- 3 397- 3 398- 3
 399- 3 400- 5 401- 7 402- 8 403-11 404-19 405-30 406-40 407-44 408-49 409-49 410-49 411-53 412-36 413-22

414-12 415- 6 416- 7 417- 5 418- 4

HURDAT STORM 545, # STATIONS-MAX SURGE 70

273- 3 274- 8 275- 9 276- 9 277- 8 278- 9 279-10 280-13 281- 8 282- 9 283- 5 284- 4 285- 7 286- 7 287- 8
288-14 289-19 290-20 291-21 292-16 293-20 294-14 295- 9 296-11 297-13 298-13 299- 7 300- 5 301- 4 302- 5
303- 5 304- 4 305- 5 306- 4 307- 4 308- 5 309- 5 310- 5 311- 5 312- 5 313- 5 314- 5 315- 5 316- 5 317- 5 318- 5 319- 6 320- 7 321- 6 322- 8 323- 8 324-10
325-14 326-13 327-16 328-14 329-24 330-24 331-27 332-26 333-27 334-22 335-18 336-14 337-12 338-10 339- 9
400-12 401-14 402-14 403-16 404-16 405- 9 406-10 407-10 408- 8 409- 8

HURDAT STORM 546, # STATIONS-MAX SURGE 20

273- 5 274-12 275-13 276- 9 277- 7 278- 6 279- 4 364- 4 365- 4 366- 4 368- 3 375- 3 403- 4 404- 6 405- 9
406-14 407-16 408-19 409-16 410- 4

HURDAT STORM 552, # STATIONS-MAX SURGE 57

268- 4 269- 4 270- 5 271- 3 272- 3 273- 3 274- 6 275- 6 276- 8 277-10 278-13 279-18 280-23 281-14 282-10 283- 4
284- 3 285- 4 286- 4 287- 5 288- 9 289-15 290-16 291-16 292-11 293-10 294- 6 295- 4 296- 4 297- 4 298- 3
305- 4 306- 5 307- 6 308- 4 309- 9 310-11 311-16 312-18 313-21 314-16 315-11 316- 7 317- 8 318- 7 319- 7 320- 7
400-12 401-18 402-22 403-27 404-28 405-15 406- 7 407- 5 408- 6 413- 4 414- 4 415- 3

HURDAT STORM 562, # STATIONS-MAX SURGE 118

156- 4 157- 4 158- 4 166- 5 167- 7 168- 7 169- 7 170- 5 171- 4 172- 4 173- 4 174- 5 175- 5 176- 4 177- 6
178- 6 179- 6 180- 7 181- 9 182- 5 183- 7 184- 9 185- 5 186- 7 187- 4 188- 6 189- 6 190- 7 191- 8 192-11
193-12 194-14 195-17 196-11 197-14 198- 9 199-13 200- 9 201-12 202- 9 266- 4 267- 6 268- 4 270- 5 271- 7
272-13 273- 5 274- 4 289- 5 290- 6 291- 6 292- 5 293- 4 309- 4 310- 5 311- 7 312- 8 313- 7 314- 5 315- 4 316- 5
405- 6 406- 7 407- 5 408- 3 409- 6 410- 9 411-19 412-13 413- 8 414- 8 415- 9 416-11 417- 8 418- 7 419- 5
420- 3 421-12 422-16 423-14 424-14 425-15 426-17 427-20 428-24 429-28 430-20 431-15 432-10 433- 9 434- 8
491- 8 492- 7 493- 8 494- 9 495-11 496-12 497-11 498-10 499- 9 500- 7 501- 6 502- 7 503- 7 504- 7 505- 5
506- 4 507- 4 508- 4 509- 6 510- 7 511- 9 512-10 513-11 514- 4 520- 5 521- 4 522- 5 523- 4

HURDAT STORM 565, # STATIONS-MAX SURGE 60

126- 3 127- 4 128- 4 129- 4 130- 4 131- 4 132- 5 133- 6 134- 7 135- 6 136- 7 137- 7 138-11 139-18 140-23
141-27 142-28 143-26 144-24 145-26 146-13 147-13 148-13 149-14 150- 6 151- 6 152- 6 153- 6 154- 5 155- 5
524- 9 525- 8 526-12 527-12 528-14 529-24 530-22 531-24 532-25 533-29 534-27 535-32 536-41 537-45 538-41
539-26 540- 8 541- 7 542- 7 543- 7 544- 7 545- 6 546- 5 547- 5 548- 5 549- 4 550- 4 551- 4 552- 3 553- 3

HURDAT STORM 575, # STATIONS-MAX SURGE 4

275- 4 276- 3 402- 3 408- 3

HURDAT STORM 584, # STATIONS-MAX SURGE 24

206- 4 207- 5 208- 7 209- 8 210- 6 211-12 212- 8 213- 6 214- 9 215- 7 216-10 217- 7 218- 5 219- 6 220- 6
221- 6 222- 6 223- 7 224- 5 225- 5 226- 5 227- 4 463- 4 464- 3

HURDAT STORM 586, # STATIONS-MAX SURGE 42

126- 4 127- 4 128- 4 129- 5 130- 5 131- 5 132-12 133- 9 134-16 135-10 136- 7 137-10 138- 9 139- 8 140- 7
141- 6 142- 5 143- 3 144- 3 145- 3 532- 3 533- 3 534- 3 535- 5 536- 6 537- 8 538- 9 539-10 540-11 541-12
542-12 543-14 544-18 545-18 546-14 547- 9 548- 5 549- 5 550- 4 551- 4 552- 4 553- 3

HURDAT STORM 589, # STATIONS-MAX SURGE 34

261- 3 262- 4 263- 5 264- 5 265- 9 266-17 267-32 268-19 269- 9 270-14 271-11 272-13 273- 7 274- 7 330- 4 331- 4
350- 4 351- 4 352- 3 365- 4 409- 9 410- 9 411-18 412-19 413-22 414-20 415-34 416-45 417-17 418- 4 419- 4
420- 4 421- 4 422- 3 423- 3

HURDAT STORM 597, # STATIONS-MAX SURGE 208

214- 5 215- 5 216-12 217- 9 218- 9 219-19 220-16 221-22 222-22 223-26 224-16 225-14 226-12 227-10 228- 8
233- 7 234- 8 235- 9 236-10 237-10 238- 7 239- 6 240- 6 241- 6 242- 5 243- 4 254- 3 255-10 256-11 257- 9
258- 7 259- 6 260- 6 261- 5 262- 4 263- 4 264- 3 265- 4 266- 4 267- 4 268- 5 269- 7 270-10 271-10 272- 6
273-18 274-30 275-33 276-28 277-24 278-31 279-20 280-19 281-10 282- 7 283- 3 284- 4 285- 6 286-12 287-16
290-16 291-14 292-12 293-10 294- 7 295- 5 296- 5 297- 4 298- 3 300- 3 301- 5 302- 5 303- 6 304- 6 305- 6
306- 6 307- 7 308- 9 309- 9 310- 9 311- 9 312- 7 313- 6 314- 5 315- 8 316- 7 317- 6 318- 5 319- 5 320- 4
329- 6 330- 7 331- 9 332- 5 333- 5 334- 4 335- 3 336- 3 340- 3 341- 3 342- 3 343- 3 344- 4 345- 4 346- 7

347- 6 348- 7 349- 7 350- 9 351- 8 352- 8 353- 5 354- 6 362- 7 363- 9 364-14 365-14 366-14 367-13 368-17
 369-10 370-14 371-11 372-10 373- 9 374- 6 375- 6 376- 6 377- 5 378- 6 379- 6 380- 4 381- 5 382- 4 383- 3
 384- 4 385- 3 386- 5 387- 6 388- 4 389- 9 390-11 391-13 392-13 393-18 394-16 395-16 396- 9 397- 8 398- 5
 399- 5 400- 8 401-13 402-17 403-23 404-39 405-55 406-49 407-46 408-37 409-34 410-16 411- 5 412- 9 413-10
 414- 6 415- 5 416- 3 417- 3 419- 3 420- 4 421- 5 422- 6 423- 6 424- 7 425- 7 426-10 427-13 428-14 429- 6
 440- 4 441- 5 442- 6 443- 8 444-11 445-11 446-15 447-12 448-11 449- 8 450- 6 451- 3 452- 9 453-17 454-11
 455-12 456-14 457-25 458-31 459-33 460-31 461-16 462-16 463-17 464-14 465-10 466- 9 467- 5

HURDAT STORM 598, # STATIONS-MAX SURGE 34

166- 5 167- 7 168-10 169-12 170-12 171- 9 172- 7 173- 5 174- 4 177- 4 178- 3 179- 3 180- 3 181- 3 496- 3
 497- 3 498- 4 499- 4 500- 4 501- 4 502- 5 503- 6 504- 6 505- 6 506- 8 507-10 508-13 509-17 510-14 511-12
 512-10 513-13 514- 5 515- 3

HURDAT STORM 602, # STATIONS-MAX SURGE 63

109- 3 110- 3 111- 4 112- 4 113- 4 114- 5 115- 5 116- 4 117- 5 118- 5 119- 5 120- 8 121-10 122-16 123-24
 124-29 125-28 126-44 127-33 128-24 129-33 130-25 131-19 132-26 133-21 134-30 135-23 136-19 137-24 138-21
 139-10 140-10 539-22 540-23 541-26 542-27 543-29 544-32 545-31 546-32 547-31 548-33 549-36 550-39 551-42
 552-53 553-48 554-37 555-25 556-16 557- 8 558- 4 559- 4 560- 5 561- 4 562- 4 563- 5 564- 5 565- 5 566- 5
 567- 4 568- 4 569- 3

HURDAT STORM 604, # STATIONS-MAX SURGE 33

318- 4 319- 4 321- 4 322- 3 323- 3 324- 3 325- 5 326- 4 327- 4 328- 4 329- 4 330- 4 331- 4 346- 3 349- 3
 350- 4 351- 4 352- 4 353- 4 354- 4 355- 5 356- 5 357- 3 358- 4 359- 5 360- 5 361- 5 362- 7 363- 7 364- 4
 366- 3 367- 3 368- 3

HURDAT STORM 606, # STATIONS-MAX SURGE 34

319- 3 320- 3 321- 4 322- 4 323- 4 324- 4 325- 4 326- 4 327- 4 328- 4 329- 4 330- 4 331- 4 332- 4 333- 3
 334- 3 345- 4 347- 4 348- 4 349- 3 350- 4 351- 4 352- 4 353- 4 354- 4 355- 4 356- 4 357- 4 358- 4 359- 4
 360- 4 361- 4 362- 4 363- 4

HURDAT STORM 611, # STATIONS-MAX SURGE 22

275- 3 276- 3 277- 3 278- 4 279- 4 280- 5 281- 3 282- 4 284- 3 285- 3 398- 4 399- 4 400- 4 401- 4 402- 4
 403- 5 404- 5 405- 4 406- 4 407- 4 408- 4 409- 3

HURDAT STORM 623, # STATIONS-MAX SURGE 50

263- 3 264- 4 265- 4 266- 4 267- 4 322- 4 323- 4 324- 4 325- 4 326- 4 327- 4 328- 4 329- 4 331- 5
 332- 5 333- 5 334- 5 335- 5 336- 5 337- 5 338- 5 339- 5 340- 6 341- 6 342- 5 343- 5 344- 5 345- 5 346- 6
 347- 5 348- 5 349- 5 350- 5 356- 4 357- 4 358- 4 359- 4 360- 3 361- 4 362- 3 363- 3 403- 3 404- 4 415- 4
 416- 4 417- 4 418- 4 419- 4 420- 3

HURDAT STORM 629, # STATIONS-MAX SURGE 63

238- 3 239- 4 240- 5 241- 5 242- 4 243- 3 249- 4 250- 3 254- 4 255- 8 256- 7 257- 6 258- 8 259- 6 260- 6
 261- 8 262- 6 263- 7 264- 7 265- 6 266- 4 267- 4 288- 4 289- 4 290- 4 291- 4 391- 5 392- 6 393- 6 394- 5
 395- 5 396- 5 413- 3 414- 3 415- 5 416- 7 417- 8 418-10 419-11 420-10 421-10 422-11 423-10 424- 8 425-10
 426-10 427-11 428-10 429- 9 430- 5 431- 4 432- 4 433- 7 434- 8 435- 7 436- 5 437- 4 439- 3 440- 4 441- 5
 442- 5 443- 5 444- 3

HURDAT STORM 630, # STATIONS-MAX SURGE 9

264- 3 266- 3 267- 3 409- 3 410- 9 411- 5 412- 4 413- 8 414- 7

HURDAT STORM 634, # STATIONS-MAX SURGE 100

134- 3 147- 3 148-10 149-21 150-13 151-13 152-20 153-24 154-20 155-15 156- 8 157- 4 168- 5 169-11 170- 8
 171- 7 172- 6 173- 6 174- 5 175- 4 176- 4 177- 8 178- 7 179- 7 190- 8 181- 9 182- 5 183- 7 184- 9 185- 5
 186- 7 187- 4 188- 5 189- 5 190- 6 191- 6 192- 9 193- 9 194-11 195-13 196- 8 197-10 198- 7 199- 9 200- 6
 201- 8 202- 5 203- 4 204- 3 475- 4 476- 5 477- 8 478-11 479- 9 480-10 481-11 482-13 483-15 484-20 485-23
 486-16 487-11 488- 7 489- 7 490- 7 491- 7 492- 7 493- 8 494- 9 495-11 496-11 497- 9 498-10 499-10 500-10
 501- 9 502-10 503- 9 504-10 505- 9 506-10 507-10 508-10 509-28 510-27 511- 7 520- 3 521- 6 522- 9 523-10
 524-25 525-26 526-38 527-35 528-31 529-31 530-15 531- 6 544- 3 545- 3

HURDAT STORM 635, # STATIONS-MAX SURGE 24

221- 4 222- 4 223-10 224- 8 225- 4 226- 6 227- 5 228- 4 229- 3 244- 3 280- 4 400- 3 401- 4 402- 5 403- 5
404- 5 439- 3 453- 9 454- 4 455- 4 457-11 458- 7 459- 4 460- 3

HURDAT STORM 639, # STATIONS-MAX SURGE 90

144- 3 145- 5 147- 3 148- 4 149- 7 150- 4 151- 4 152- 7 153-10 154-11 155-11 156- 9 157- 8 158- 8 159- 6
160- 4 161- 3 166- 6 167-11 168-18 169-24 170-16 171-10 172- 7 173- 6 174- 4 177- 4 220- 6 225- 7 226-11
227-15 228-15 229- 3 233- 3 234- 3 236- 4 237- 7 238- 6 239- 4 240- 3 434- 5 435- 4 436- 3 443- 5 444- 7
445- 8 446- 7 447- 5 448- 4 449- 4 450- 3 451- 3 452- 7 454- 8 455- 9 456-11 501- 3 502- 5 503- 5 504- 7
505- 7 506- 8 507-10 508-13 509-28 510-39 511-31 512-15 513-31 514- 5 515- 4 516- 4 517- 4 518- 5 519- 5
520-11 521-17 522-17 523-11 524-20 525-14 526-16 527-13 528-11 529- 9 530- 5 531- 7 532- 6 533- 5 534- 3

HURDAT STORM 643, # STATIONS-MAX SURGE 93

190- 4 191- 7 192-14 193-15 194-21 195-32 196-17 197-27 198- 7 199- 8 200- 5 206- 3 208- 5 209- 4 211- 5
212- 4 213- 3 214- 5 215- 4 216- 5 217- 4 219- 4 262- 3 263- 6 264- 5 265- 5 266- 6 267- 7 268- 4 270- 5
271- 5 272- 6 273- 4 274- 6 275- 5 276- 4 277- 4 278- 3 315- 3 317- 3 318- 3 362- 5 363- 7 364- 5 365- 5
366- 4 367- 4 368- 3 404- 4 405- 4 406- 5 407- 5 408- 6 409- 7 410- 5 411- 6 412- 7 413- 7 414- 6 415- 8
416-11 417-11 418-11 419-10 420- 9 421- 6 422- 5 459- 3 460- 4 461- 4 462- 5 463- 6 464- 6 465- 6 466- 8
467- 6 468- 6 469- 5 470- 5 471- 5 472- 7 473- 4 479- 4 480- 8 481-11 482-34 483-40 484-48 485-40 486-27
487-19 488- 9 489- 4

HURDAT STORM 651, # STATIONS-MAX SURGE 14

104- 3 446- 3 452- 5 455- 4 456- 7 574- 3 575- 3 576- 3 577- 4 682- 3 683- 4 684- 7 685- 6 686- 4

HURDAT STORM 657, # STATIONS-MAX SURGE 48

289- 5 290- 6 291- 7 292- 6 293- 7 294- 8 295- 9 296-10 297-11 298- 9 299- 6 300- 5 301- 5 302- 6 303- 6
304- 5 305- 5 306- 5 307- 5 308- 4 309- 4 310- 4 311- 4 312- 4 372- 5 373- 5 374- 5 375- 5 376- 5 377- 5
378- 6 379- 6 380- 6 381- 6 382- 6 383- 6 384- 8 385-10 386-11 387-10 388-11 389-11 390- 9 391-10 392-10
393- 9 394- 5 395- 3

HURDAT STORM 662, # STATIONS-MAX SURGE 69

211- 4 212- 4 213- 4 214- 7 215- 6 216-10 217- 7 218- 5 219- 7 220- 5 221- 6 222- 6 223- 6 224- 5 225- 4
247- 3 248- 4 249- 5 250- 3 254- 3 255- 5 256- 4 257- 4 258- 6 259- 6 260- 5 261- 8 262- 6 263- 7 264- 5
265- 3 404- 4 405- 6 406- 7 407- 6 408- 5 412- 3 417- 4 418- 5 419- 6 420-10 421-11 422-12 423- 9 424- 7
425- 8 426- 7 427- 6 428- 6 429- 6 430- 4 431- 3 433- 7 434- 8 435- 4 453- 4 457- 6 458- 8 459- 8 460- 9
461- 8 462- 9 463-13 464-14 465-12 466-10 467- 6 468- 4 469- 3

HURDAT STORM 669, # STATIONS-MAX SURGE 94

189- 4 190- 4 201- 5 202- 7 203- 8 204-12 205-15 206-16 207-13 208-17 209-12 210- 8 211-11 212- 8 213- 3
214- 4 215- 3 216- 3 255- 4 256-10 257-13 258-21 259-22 260-21 261-21 262-16 263-17 264-13 265-10 266- 8
267- 8 268- 9 269- 8 270-11 271- 9 272- 7 273- 8 274- 9 275- 8 276- 7 277- 7 278- 6 279- 5 280- 5 281- 5
282- 4 399- 3 400- 4 401- 4 402- 5 403- 5 404- 5 405- 6 406- 7 407- 8 408- 8 409-10 410- 7 411- 8 412-10
413-13 414-10 415-10 416- 8 417-10 418-12 419-15 420-20 421-21 422-23 423-26 424-26 425-25 426-18 427-12
428- 5 463- 3 464- 4 465- 4 466-11 467-10 468-12 469-12 470-15 471-18 472-24 473-21 474-20 475-18 476-17
477-15 478- 9 489- 3 490- 4

HURDAT STORM 672, # STATIONS-MAX SURGE 69

158- 5 159- 5 160- 7 161- 9 162-11 163-11 164-11 165-15 166-22 167-33 168-41 169-50 170-46 171-35 172-26
173-21 174-17 175-13 176-10 177-15 178-12 179-10 180-11 181-10 182- 8 183- 8 185- 7 291- 3 292-10 293-15
294-10 295- 6 296- 5 297- 6 298- 5 385- 6 386- 6 387-10 388- 6 389-17 390-17 391-12 392- 5 496-10 497-10
498-11 499-12 500-13 501-13 502-17 503-19 504-23 505-24 506-27 507-34 508-44 509-77 510-62 511-54 512-56
513-58 514-26 515-17 516-14 517-11 518- 9 519- 7 520- 8 521- 9

HURDAT STORM 676, # STATIONS-MAX SURGE 11

336- 4 337- 5 338- 3 339- 4 340- 4 341- 5 342- 7 343- 8 344- 4 345- 4 346- 4

HURDAT STORM 688, # STATIONS-MAX SURGE 34

197- 3 199- 4 200- 4 201- 7 202- 6 203- 5 204- 4 205- 4 206- 4 207- 3 208- 4 209- 3 211- 3 465- 3 466- 3
467- 4 468- 3 469- 4 470- 4 471- 4 472- 5 473- 5 474- 5 475- 5 476- 5 477- 7 478- 9 479-10 480- 6 481- 5
482- 4 483- 3 484- 3 485- 3

HURDAT STORM 690, # STATIONS-MAX SURGE 50

116- 6 117- 6 118-10 119-16 120-15 121-26 122-21 123-34 124-24 125-18 126-25 127-20 128-16 129-20 130-16
131-13 132-18 133-15 134-20 135-14 136-10 137-13 138- 9 139- 5 140- 4 539- 8 540-10 541-14 542-17 543-19
544-21 545-21 546-21 547-20 548-21 549-22 550-23 551-24 552-29 553-30 554-33 555-35 556-35 557-31 558-24
559-17 560- 9 561- 6 562- 5 563- 3

HURDAT STORM 693, # STATIONS-MAX SURGE 15

101- 6 102- 5 103- 5 104- 6 106- 3 565- 3 566- 3 570- 3 571- 4 572- 5 573- 5 574- 6 575- 6 576- 7 577-10

HURDAT STORM 702, # STATIONS-MAX SURGE 69

274- 5 275- 6 276- 6 277- 6 278- 9 279- 8 280-10 281- 5 282- 4 291- 5 292- 6 293-10 294- 8 295- 5 296- 7
297- 9 298- 9 299- 8 300- 8 301- 7 302- 9 303- 7 304- 8 305-14 306-12 307- 8 308- 5 309- 4 310- 4 311- 3
364- 3 365- 3 366- 4 367- 3 368- 4 370- 4 371- 5 372- 6 373-11 374-14 375-20 376-18 377- 9 378- 8 379-10
380-11 381-11 382-14 383-12 384-12 385- 9 386- 8 387- 9 388-10 389-13 390-12 391-10 392-10 393- 4 400- 4
401- 6 402- 9 403-12 404-18 405-15 406-10 407- 8 408- 6 409- 5

HURDAT STORM 703, # STATIONS-MAX SURGE 120

101- 4 102- 4 103- 5 104- 7 105- 3 106- 5 107- 3 108- 5 109- 6 110- 6 111- 5 112- 4 113- 4 114- 4 115- 4
116- 3 118- 3 119- 3 120- 3 121- 4 122- 3 123- 4 124- 4 125- 3 126- 4 127- 4 128- 5 129- 5 130- 6 131- 6
132- 7 133- 7 134- 8 135- 8 136- 8 137- 8 138- 8 139-10 140-12 141-12 142-15 143-18 144-21 145-24 146-10
147-11 148-11 149-13 150- 6 151- 6 152- 7 153- 8 154- 7 155- 6 169- 6 170- 4 171- 3 499- 3 506- 3 507- 4
508- 4 509-12 510-13 521- 4 522- 4 523- 4 524-10 525- 9 526-13 527-14 528-16 529-25 530-17 531-22 532-23
533-26 534-24 535-23 536-17 537-13 538-10 539- 9 540- 8 541- 8 542- 8 543- 8 544- 8 545- 8 546- 7 547- 7
548- 6 549- 5 550- 5 551- 5 552- 4 553- 4 554- 4 555- 4 556- 4 557- 4 558- 4 559- 4 560- 4 561- 4 562- 4
563- 5 564- 5 565- 5 566- 6 567- 7 568- 7 569- 7 570- 7 571- 7 572- 7 573- 6 574- 6 575- 6 576- 6 577- 6

HURDAT STORM 704, # STATIONS-MAX SURGE 67

116- 3 118- 4 119- 7 120- 4 121- 7 122- 4 123- 8 124- 7 125- 6 126-11 127- 9 128- 8 129-15 130-11 131- 8
132-13 133- 9 134-13 135- 9 136- 6 137- 8 138- 5 139- 4 140- 3 146- 3 167- 6 168- 8 169-10 170- 7 171- 5
172- 4 504- 3 505- 3 506- 4 507- 5 508- 6 509-14 510-20 511-13 512- 9 513-13 514- 4 538- 4 539- 5 540- 7
541- 9 542-10 543-12 544-14 545-15 546-16 547-15 548-16 549-16 550-15 551-13 552-14 553-12 554-10 555- 8
556- 9 557- 9 558- 9 559- 8 560- 6 561- 5 562- 4

HURDAT STORM 711, # STATIONS-MAX SURGE 24

256- 3 257- 3 258- 4 259- 4 260- 5 261- 8 262-10 263-15 264-12 265-10 266- 8 267- 7 416- 8 417-10 418-12
419-15 420-20 421-15 422- 8 423- 6 424- 5 425- 4 426- 4 427- 4

HURDAT STORM 712, # STATIONS-MAX SURGE 148

183- 4 184- 5 185- 5 186- 8 187- 8 188-13 189-16 190-15 191-14 192-20 193-18 194-17 195-18 196-14 197-14
198-12 199-13 200-10 201-11 202- 9 203- 7 204- 6 205- 6 206- 5 207- 4 208- 5 209- 4 210- 3 211- 4 212- 3
271- 3 272- 8 273- 3 275- 5 276- 4 277- 3 278- 4 286- 3 287- 4 288- 6 289- 8 290- 7 291- 6 292- 4 293- 4
294- 4 295- 4 296- 4 297- 5 298- 5 299- 5 300- 6 301- 8 302-12 303-16 304-14 305-14 306-17 307-16 308-14
309-12 310-12 311- 9 312- 7 313- 7 314- 6 315- 6 316- 5 317- 5 318- 4 319- 3 362- 4 363- 5 364- 8 365- 7
366- 8 367- 9 368-10 369- 9 370-11 371-14 372-16 373-22 374-23 375-20 376-14 377-16 378-16 379-12 380- 7
381- 9 382- 6 383- 5 384- 5 385- 5 386- 4 387- 4 388- 6 389- 4 390- 4 391- 6 392- 7 393- 9 394- 8 395- 7
396- 5 397- 4 400- 5 401- 5 404- 5 405- 9 406-10 407- 8 408- 8 409- 4 410- 6 411-13 412- 7 468- 4 469- 4
470- 5 471- 5 472- 6 473- 6 474- 6 475- 6 476- 7 477- 9 478-13 479-13 480-13 481-15 482-15 483-18 484-21
485-29 486-27 487-25 488-19 489-19 490-19 491-17 492-10 493- 9 494- 7 495- 6 496- 4 497- 3

HURDAT STORM 722, # STATIONS-MAX SURGE 52

126- 3 127- 4 128- 6 129-10 130-11 131- 6 132-11 133-12 134-21 135-17 136-15 137-20 138-17 139-15 140-13
141-11 142-10 143- 9 144- 8 145- 8 146- 6 147- 5 148- 5 149- 4 150- 3 151- 3 527- 4 528- 3 529- 5 530- 5
531- 7 532- 7 533- 9 534- 9 535- 9 536-11 537-13 538-16 539-18 540-19 541-22 542-23 543-23 544-22 545-17
546-13 547- 9 548-13 549-10 550- 6 551- 5 552- 4

HURDAT STORM 731, # STATIONS-MAX SURGE 68

138- 4 139- 4 140- 5 143- 5 144-10 145-19 146- 8 147-11 148-15 149-19 150-11 151-11 152-17 153-24 154-28
155-28 156-19 157-12 158- 8 159- 6 160- 5 161- 4 162- 3 164- 3 165- 4 166- 6 167- 9 168-15 169-19 170-13
171- 9 172- 7 173- 6 506- 7 507- 8 508-11 509-22 510-33 511-23 512-12 513-22 514- 6 515- 5 516- 5 517- 5
518- 5 519- 6 520- 8 521-14 522-21 523-23 524-46 525-35 526-39 527-32 528-25 529-25 530-20 531-26 532-24

533-21 534-11 535- 7 536- 5 537-10 538- 9 539- 6 540- 5

HURDAT STORM 739, # STATIONS-MAX SURGE 20

101- 9 102-11 103-13 104-13 105- 6 106- 7 107- 4 108- 4 109- 3 563- 3 568- 3 569- 4 570- 6 571- 6 572- 9
573-11 574-14 575-16 576-16 577-14

HURDAT STORM 741, # STATIONS-MAX SURGE 43

180- 6 181-11 182- 5 183- 8 184-11 185- 7 186-10 187- 6 188- 8 189- 8 190- 7 191- 7 192-10 193-10 194-10
195-11 196- 8 197- 9 198- 7 199- 8 200- 6 480- 9 481-10 482-11 483-12 484-14 485-17 486-15 487-13 488-10
489- 9 490-10 491-10 492- 9 493-10 494-12 495-13 496-12 497-11 498-10 499- 4 500- 3 504- 3

HURDAT STORM 746, # STATIONS-MAX SURGE 64

188- 5 189- 7 190- 9 191-10 192-13 193-14 194-14 195-19 196-15 197-22 198-15 199-20 200-14 201-18 202-13
203-10 204- 9 205- 7 206- 5 207- 4 208- 5 209- 4 261- 5 262- 6 263- 7 264- 7 265- 6 266- 5 267- 5 270- 3
412- 3 413- 4 414- 3 415- 4 416- 6 417- 7 418- 9 419-10 420-10 421- 8 422- 6 469- 4 470- 4 471- 5 472- 6
473- 6 474- 8 475-10 476-13 477-19 478-24 479-20 480-22 481-25 482-28 483-29 484-25 485-19 486-17 487-15
488-12 489-10 490- 8 491- 5

HURDAT STORM 748, # STATIONS-MAX SURGE 47

297- 3 298- 3 299- 4 300- 5 301- 6 302- 8 303- 9 304- 9 305-10 306-12 307-12 308-10 309- 8 310- 9 311- 7
312- 5 313- 5 314- 4 315- 5 316- 4 317- 4 318- 3 362- 3 363- 4 364- 7 365- 7 366- 8 367- 7 368- 9 369- 7
370- 8 371-11 372-13 373-19 374-17 375-16 376-10 377-10 378- 9 379- 9 380- 6 381- 7 382- 5 383- 4 384- 4
385- 3 388- 3

HURDAT STORM 756, # STATIONS-MAX SURGE 39

101-13 102-14 103-13 104-13 105- 9 106- 9 107- 7 108- 7 109- 8 110- 7 111- 7 112- 7 113- 6 114- 7 115- 7
116- 6 117- 5 118- 5 119- 5 120- 4 122- 4 560- 6 561- 6 562- 6 563- 8 564- 8 565- 8 566- 9 567- 9 568- 8
569- 9 570- 9 571-10 572-11 573-12 574-13 575-15 576-18 577-20

HURDAT STORM 757, # STATIONS-MAX SURGE 17

148- 3 149- 3 150- 3 151- 3 152- 5 153- 7 154- 6 155- 4 509- 4 510- 4 524- 6 525- 7 526-12 527- 8 528- 3
529-11 530- 5

HURDAT STORM 775, # STATIONS-MAX SURGE 27

153- 4 154- 8 155- 8 156- 8 157- 5 158- 3 168- 5 169- 7 170- 4 171- 3 289- 4 290- 3 393- 5 394- 5 395- 4
507- 3 508- 4 509-10 510-15 511- 7 513- 6 520- 3 521- 7 522- 9 523- 9 524-12 525- 9

HURDAT STORM 777, # STATIONS-MAX SURGE 68

244- 4 245- 5 246- 4 247- 3 249- 6 250- 5 251- 4 252- 3 253- 6 254-10 255-17 256-15 257-13 258-16 259-16
260-17 261-21 262-22 263-31 264-26 265-21 266-16 267-17 268-11 269- 6 270- 9 271- 8 272- 9 273- 4 274- 4
275- 3 341- 3 346- 4 406- 4 407- 4 408- 5 409- 4 410- 5 411-12 412-13 413-14 414-14 415-20 416-26 417-27
418-36 419-43 420-41 421-30 422-21 423-20 424-18 425-18 426-17 427-19 428-19 429-16 430-10 431- 8 432- 7
433-11 434-12 435-12 436- 9 437- 6 438- 5 439- 4 684- 4

HURDAT STORM 779, # STATIONS-MAX SURGE 57

164- 3 165- 4 166- 5 167- 5 168- 6 169- 5 170- 5 171- 8 172-10 173-15 174-18 175-16 176-12 177-18 178-13
179-11 180-10 181-10 182- 8 183- 8 184- 8 185- 7 186- 7 187- 7 188- 8 189- 9 190- 9 346- 4 375- 3 376- 3
488-11 489-11 490-11 491-10 492- 8 493- 8 494- 8 495- 9 496-10 497-10 498-11 499-12 500-13 501-14 502-20
503-25 504-31 505-28 506-18 507-11 508- 7 511- 7 512- 8 513- 8 514- 5 515- 4 516- 3

HURDAT STORM 783, # STATIONS-MAX SURGE 48

101- 6 102- 5 103- 6 106- 4 107- 9 108-11 109-18 110-21 111-25 112-20 113-13 114-23 115-21 116-19 117-12
118-13 119-15 120-11 121-14 122-11 123-14 124-12 125-10 126-13 127-11 128-10 550-13 551-13 552-14 553-14
554-14 555-15 556-15 557-16 558-16 559-16 560-18 561-19 562-22 563-29 564-26 565-28 566-31 567-33 568-24
569-19 684- 3 685- 3

HURDAT STORM 797, # STATIONS-MAX SURGE 30

223- 5 229- 3 260- 3 261- 4 262- 4 263- 5 264- 4 265- 4 266- 4 267- 5 268- 4 269- 4 270- 7 271- 7 272-10
273- 7 274- 6 275- 7 276- 6 277- 5 278- 6 400- 3 401- 3 403- 4 404- 8 405-13 406-13 407-11 408-10 409- 7
410-10 411-13 412-11 413-10 414- 8 415- 7 416- 6 417- 5 418- 6 419- 6 420- 7 421- 6 422- 5 423- 5 424- 4

425- 4 453- 3 457- 5 458- 4 459- 4

MURDAT STORM 805, # STATIONS-MAX SURGE 14

310- 3 313- 3 317- 3 360- 3 363- 4 364- 3 366- 3 367- 3 368- 3 369- 3 370- 3 371- 3 372- 3 381- 3

MURDAT STORM 807, # STATIONS-MAX SURGE 95

197- 3 199- 4 200- 3 201- 4 202- 4 203- 3 204- 5 205- 6 206- 6 207- 5 208- 8 209- 6 210- 4 211- 7 212- 5
213- 3 214- 5 215- 3 216- 5 217- 3 238- 5 259- 5 260- 6 261- 6 262- 6 263- 5 264- 5 265- 4 266- 3 269- 4
270- 4 271- 5 272- 5 273- 6 274- 8 275- 9 276- 6 277- 5 278- 7 279- 4 280- 4 284- 3 287- 3 397- 5 398- 4
401- 5 402- 5 403- 5 404-11 405-14 406-14 407-12 408-10 409- 9 410- 7 411- 5 412- 5 413- 5 414- 4 416- 4
417- 4 418- 5 419- 6 420- 7 421- 6 422- 7 423- 7 424- 5 425- 7 426- 5 459- 3 460- 4 461- 3 462- 4 463- 5
464- 6 465- 7 466- 8 467- 6 468- 7 469- 7 470- 9 471- 9 472- 9 473- 8 474- 8 475- 8 476- 6 477- 4 478- 4
479- 4 480- 4 481- 4 482- 4 483- 4

MURDAT STORM 809, # STATIONS-MAX SURGE 43

129- 3 130- 4 131- 4 132- 5 133- 5 134- 7 135- 7 136- 7 137- 9 138-10 139-11 140-12 141-10 142- 9 143- 7
144- 7 145- 7 146- 4 147- 3 148- 3 149- 3 528- 3 529- 6 530- 5 531- 5 532- 6 533- 7 534- 7 535- 9 536-12
537-17 538-20 539-17 540-11 541- 9 542- 8 543- 7 544- 7 545- 6 546- 5 547- 4 548- 4 549- 3

MURDAT STORM 812, # STATIONS-MAX SURGE 34

127- 3 128- 4 129- 4 130- 6 131- 9 132-15 133-16 134-29 135-20 136-17 137-26 138-22 139-19 140-15 141-13
142- 9 143- 3 533- 3 535- 3 536-14 537-19 538-22 539-24 540-26 541-29 542-29 543-29 544-32 545-28 546-17
547- 8 548- 5 549- 3 550- 3

MURDAT STORM 813, # STATIONS-MAX SURGE 15

108- 4 109- 5 110- 4 111- 3 114- 3 562- 3 563- 4 564- 3 565- 4 566- 4 567- 5 568- 6 569- 7 570- 6 571- 4

MURDAT STORM 820, # STATIONS-MAX SURGE 16

269- 6 270- 9 271-10 273-16 274-24 275-20 276-11 277- 5 278- 4 406-13 407-19 408-25 409-17 410- 7 413- 9
414- 4

MURDAT STORM 832, # STATIONS-MAX SURGE 25

143- 5 144-11 145-15 146- 7 147- 7 148- 7 149- 6 150- 4 151- 4 152- 4 153- 3 510- 3 525- 3 526- 5 527- 5
528- 6 529-10 530-10 531-12 532-14 533-17 534-12 535- 5 536- 3 539- 3

MURDAT STORM 833, # STATIONS-MAX SURGE 68

171- 4 172- 5 173- 5 174- 6 175- 6 176- 5 177-10 178- 7 179- 5 180- 5 181- 5 183- 3 184- 3 187- 4 188- 7
189-11 190-11 191- 9 192-13 193- 7 194- 6 195- 6 196- 6 197- 6 198- 7 199-10 200- 9 201-11 202- 9 203- 8
204- 6 205- 4 474- 5 475- 7 476- 9 477-10 478-13 479-10 480-10 481- 8 482- 6 483- 6 484- 6 485- 7 486- 8
487-16 488-14 489-14 490-13 491- 9 492- 4 494- 4 495- 4 496- 4 497- 5 498- 5 499- 6 500- 7 501- 8 502-11
503-13 504-14 505-12 506- 9 507-10 508- 8 509- 7 510- 4

MURDAT STORM 835, # STATIONS-MAX SURGE 138

268- 4 269- 5 270- 6 271- 5 272- 4 273- 5 274- 8 275- 6 276- 6 277- 5 278- 4 279- 7 280-13 281-13 282-15
283-10 284-12 285-18 286-21 287-22 288-33 289-36 290-35 291-33 292-29 293-28 294-26 295-25 296-28 297-33
298-32 299-29 300-31 301-32 302-42 303-35 304-36 305-42 306-42 307-40 308-34 309-27 310-30 311-23 312-18
313-16 314-14 315-17 316-15 317-14 318-11 319-10 320- 5 324- 4 327- 5 328- 6 329- 7 330- 9 331-10 332- 6
333- 7 334- 5 335- 4 336- 4 337- 3 339- 3 340- 3 341- 4 342- 4 343- 4 344- 4 345- 5 346- 8 347- 7 348- 8
349- 8 350-10 351-10 352- 9 353- 6 354- 8 355- 5 359- 4 360- 6 361- 5 362-12 363-15 364-24 365-25 366-26
367-23 368-29 369-22 370-27 371-33 372-39 373-35 374-61 375-35 376-45 377-39 378-35 379-45 380-37 381-44
382-39 383-36 384-32 385-33 386-29 387-27 388-34 389-28 390-28 391-31 392-33 393-38 394-37 395-38 396-33
397-31 398-27 399-20 400-15 401-18 402-17 403-12 404- 6 405- 3 406- 5 407- 6 408- 6 409- 9 410- 5 411- 3
412- 6 413- 7 414- 5

MURDAT STORM 838, # STATIONS-MAX SURGE 99

143- 8 144-16 145-24 146-13 147-14 148-10 149-18 150-10 151-10 152-11 153-13 154-14 155-13 156- 8 157- 6
158- 5 159- 3 160- 3 161- 3 164- 3 165- 5 166- 8 167-12 168-17 169-19 170-15 171-12 172-10 173-10 174-10
175- 8 176- 6 177-13 178- 9 179- 7 180- 7 181- 7 182- 4 183- 5 184- 6 185- 4 186- 5 187- 4 188- 4 189- 5
190- 5 191- 5 192- 7 193- 7 486-11 487- 9 488- 7 489- 6 490- 6 491- 6 492- 5 493- 5 494- 6 495- 7 496- 7
497- 7 498- 8 499- 9 500-10 501-11 502-16 503-16 504-17 505-15 506-12 507-12 508-13 509-14 510-20 511-24

512-16 513-25 514- 6 515- 4 516- 4 517- 4 518- 4 519- 4 520- 6 521- 9 522-13 523-10 524-20 525-17 526-20
527-18 528-18 529-19 530-18 531-11 532- 8 533-26 534-16 535- 6

HURDAT STORM 839, # STATIONS-MAX SURGE 101

169- 3 170- 3 177- 3 178- 3 179- 3 180- 4 181- 4 182- 4 183- 4 184- 5 185- 7 186-10 187-12 188-17 189-18
190-16 191-14 192-20 193-18 194-17 195-18 196-13 197-14 198-11 199-13 200-10 201-11 202- 9 203- 7 204- 6
205- 5 265- 3 266- 5 267- 8 268- 5 270- 6 271- 8 272-15 273- 8 274- 6 275- 8 276- 7 277- 7 278- 8 279- 6
280- 4 281- 3 402- 4 403- 4 404- 8 405-10 406-12 407- 9 408-11 409- 7 410-12 411-19 412-14 413- 8 414- 9
415-10 416-12 417- 9 418- 8 419- 5 475- 6 476- 8 477-10 478-13 479-12 480-13 481-15 482-16 483-19 484-24
485-33 486-28 487-26 488-20 489-20 490-22 491-23 492-16 493-12 494- 7 495- 5 496- 4 497- 4 498- 4 499- 4
500- 4 501- 3 502- 3 503- 3 504- 3 505- 3 509- 3 510- 4 511- 4 512- 3 513- 4

HURDAT STORM 841, # STATIONS-MAX SURGE 31

133- 3 134- 4 135- 4 136- 4 137- 5 138- 7 139- 8 140- 8 141- 7 142- 6 143- 5 144- 5 145- 5 146- 3 530- 3
531- 4 532- 4 533- 5 534- 5 535- 6 536- 8 537-10 538-12 539-13 540-10 541- 5 542- 4 543- 4 544- 4 545- 4
546- 3

HURDAT STORM 852, # STATIONS-MAX SURGE 2

454- 5 455- 4

HURDAT STORM 859, # STATIONS-MAX SURGE 25

161- 3 166- 4 167- 7 168-12 169-15 170- 9 171- 6 172- 4 173- 3 504- 3 505- 4 506- 4 507- 5 508- 7 509-16
510-24 511-21 512-12 513-23 514- 4 515- 4 516- 4 517- 4 518- 4 519- 3

HURDAT STORM 864, # STATIONS-MAX SURGE 36

206- 4 207- 5 208- 5 209- 8 210- 6 211-11 212- 8 213- 5 214- 8 215- 5 216- 7 217- 4 219- 4 220- 3 221- 4
222- 4 223- 4 224- 3 453- 3 457- 4 458- 5 459- 5 460- 5 461- 4 462- 6 463- 8 464-10 465-11 466-13 467-11
468-13 469-12 470-11 471- 5 472- 4 473- 3

HURDAT STORM 857, # STATIONS-MAX SURGE 39

130- 3 131- 3 132- 4 133- 4 134- 5 135- 6 136- 6 137- 9 138-10 139-11 140-10 141- 9 142- 8 143- 7 144- 6
145- 6 146- 4 147- 4 148- 4 149- 3 529- 4 530- 5 531- 5 532- 6 533- 7 534- 7 535- 8 536-10 537-12 538-15
539-16 540-15 541-10 542- 8 543- 7 544- 5 545- 4 546- 4 547- 3

HURDAT STORM 872, # STATIONS-MAX SURGE 51

231- 4 232- 3 253- 3 254- 3 255- 4 256- 4 257- 4 258- 4 259- 3 260- 3 261- 3 263- 4 264- 5 265- 6 266- 6
267- 8 268-25 269-29 270-45 271-38 272-36 273-19 274-19 275-16 276-12 277- 9 406-14 407-16 408-18 409-23
410-23 411-44 412-56 413-65 414-58 415-36 416- 9 417- 6 418- 6 419- 5 420- 3 422- 3 423- 3 424- 3 425- 4
426- 4 427- 4 428- 4 679- 5 680- 8 681- 5

HURDAT STORM 874, # STATIONS-MAX SURGE 39

128- 3 129- 4 130- 5 131- 7 132-12 133-13 134-23 135-16 136-12 137-16 138-13 139-10 140- 8 141- 7 142- 6
143- 6 144- 6 145- 7 146- 3 530- 4 531- 7 532- 7 533- 8 534- 7 535- 8 536- 9 537-11 538-12 539-13 540-15
541-18 542-20 543-22 544-25 545-23 546-12 547- 7 548- 5 549- 3

WIS/NEARSHORE STATION 101, # HURDAT STORMS-MAX SURGE 5

693- 6 703- 4 739- 9 756-13 783- 6

WIS/NEARSHORE STATION 102, # HURDAT STORMS-MAX SURGE 5

693- 5 703- 4 739-11 756-14 783- 5

WIS/NEARSHORE STATION 103, # HURDAT STORMS-MAX SURGE 4

693- 5 703- 5 739-13 756-13

WIS/NEARSHORE STATION 104, # HURDAT STORMS-MAX SURGE 5

651- 3 693- 6 703- 7 739-13 756-13

WIS/NEARSHORE STATION 105, # HURDAT STORMS-MAX SURGE 4

703- 3 739- 6 756- 9 783- 6

WIS/NEARSHORE STATION 106, # HURDAT STORMS-MAX SURGE 6
 324- 3 693- 3 703- 5 739- 7 756- 9 783- 4

WIS/NEARSHORE STATION 107, # HURDAT STORMS-MAX SURGE 5
 324- 4 703- 3 739- 4 756- 7 783- 9

WIS/NEARSHORE STATION 108, # HURDAT STORMS-MAX SURGE 7
 324- 5 445- 3 703- 5 739- 4 756- 7 783-11 813- 4

WIS/NEARSHORE STATION 109, # HURDAT STORMS-MAX SURGE 8
 324- 8 445- 4 602- 3 703- 6 739- 3 756- 8 783-18 813- 5

WIS/NEARSHORE STATION 110, # HURDAT STORMS-MAX SURGE 8
 218- 4 324-10 445- 4 602- 3 703- 6 756- 7 783-21 813- 4

WIS/NEARSHORE STATION 111, # HURDAT STORMS-MAX SURGE 8
 218-10 324-12 445- 5 602- 4 703- 5 756- 7 783-25 813- 3

WIS/NEARSHORE STATION 112, # HURDAT STORMS-MAX SURGE 7
 218-15 324-10 445- 5 602- 4 703- 4 756- 7 783-20

WIS/NEARSHORE STATION 113, # HURDAT STORMS-MAX SURGE 7
 218-14 324- 8 445- 4 602- 4 703- 4 756- 6 783-13

WIS/NEARSHORE STATION 114, # HURDAT STORMS-MAX SURGE 8
 218-20 324-10 445- 5 602- 5 703- 4 756- 7 783-23 813- 3

WIS/NEARSHORE STATION 115, # HURDAT STORMS-MAX SURGE 7
 218-22 324- 9 445- 6 602- 5 703- 4 756- 7 783-21

WIS/NEARSHORE STATION 116, # HURDAT STORMS-MAX SURGE 9
 218-21 324- 7 445- 6 602- 4 690- 6 703- 3 704- 3 756- 6 783-19

WIS/NEARSHORE STATION 117, # HURDAT STORMS-MAX SURGE 7
 218-13 324- 6 445- 5 602- 5 690- 6 756- 5 783-12

WIS/NEARSHORE STATION 118, # HURDAT STORMS-MAX SURGE 9
 218-14 324- 6 445- 6 602- 5 690-10 703- 3 704- 4 756- 5 783-13

WIS/NEARSHORE STATION 119, # HURDAT STORMS-MAX SURGE 9
 218-16 324- 6 445- 7 602- 5 690-16 703- 3 704- 7 756- 5 783-15

WIS/NEARSHORE STATION 120, # HURDAT STORMS-MAX SURGE 10
 5- 3 218-10 324- 5 445- 6 602- 8 690-15 703- 3 704- 4 756- 4 783-11

WIS/NEARSHORE STATION 121, # HURDAT STORMS-MAX SURGE 9
 5- 5 218-12 324- 6 445- 8 602-10 690-26 703- 4 704- 7 783-14

WIS/NEARSHORE STATION 122, # HURDAT STORMS-MAX SURGE 10
 5- 6 218- 9 324- 5 445- 8 602-16 690-21 703- 3 704- 4 756- 4 783-11

WIS/NEARSHORE STATION 123, # HURDAT STORMS-MAX SURGE 10
 5-12 218-12 295- 6 324- 5 445-10 602-24 690-34 703- 4 704- 8 783-14

WIS/NEARSHORE STATION 124, # HURDAT STORMS-MAX SURGE 11
 5- 9 218- 9 295- 6 324- 5 405- 4 445-11 602-29 690-24 703- 4 704- 7 783-12

WIS/NEARSHORE STATION 125, # HURDAT STORMS-MAX SURGE 11
 5- 6 218- 7 295- 5 324- 4 405- 6 445- 9 602-28 690-18 703- 3 704- 6 783-10

WIS/NEARSHORE STATION 126, 8 HURDAT STORMS-MAX SURGE 15
 5- 9 183- 4 218-10 295-10 324- 5 405- 7 445-17 565- 3 586- 4 602-44 690-25 703- 4 704-11 722- 3 783-13

WIS/NEARSHORE STATION 127, 8 HURDAT STORMS-MAX SURGE 17
 5- 7 183- 4 211- 4 218- 8 295- 7 324- 5 405-11 445-10 565- 4 586- 4 602-33 690-20 703- 4 704- 9 722- 4 783-11 812- 3

WIS/NEARSHORE STATION 128, 8 HURDAT STORMS-MAX SURGE 20
 5- 5 117- 4 183- 4 211- 6 218- 7 295- 6 310- 4 324- 5 405-13 445- 6 565- 4 586- 4 602-24 690-16 703- 5 704- 8 722- 6 783-10 812- 4 874- 3

WIS/NEARSHORE STATION 129, 8 HURDAT STORMS-MAX SURGE 20
 5- 7 117- 4 183- 5 211- 9 218- 9 295- 8 310- 5 324- 6 405-19 445-11 565- 4 586- 5 602-33 690-20 703- 5 704-15 722-10 809- 3 812- 4 874- 4

WIS/NEARSHORE STATION 130, 8 HURDAT STORMS-MAX SURGE 22
 5- 6 117- 6 183- 5 211-12 218- 8 232- 3 295- 6 310- 9 324- 6 405-19 445- 6 565- 4 586- 5 602-25 690-16 703- 6 704-11 722-11 809- 4 812- 6 867- 3 874- 5

WIS/NEARSHORE STATION 131, 8 HURDAT STORMS-MAX SURGE 22
 5- 5 117- 7 183- 5 211-13 218- 7 232- 4 295- 5 310-13 324- 5 405-16 445- 4 565- 4 586- 5 602-19 690-13 703- 6 704- 8 722- 6 809- 4 812- 9 867- 3 874- 7

WIS/NEARSHORE STATION 132, 8 HURDAT STORMS-MAX SURGE 21
 5- 6 117-10 183- 8 211-24 232- 5 295- 6 310-19 324- 6 405-26 445- 9 565- 5 586-12 602-26 690-18 703- 7 704-13 722-11 809- 5 812-15 867- 4 874-12

WIS/NEARSHORE STATION 133, 8 HURDAT STORMS-MAX SURGE 22
 5- 5 117-11 183- 8 211-24 232- 6 295- 5 310-27 324- 6 405-21 445- 7 565- 6 586- 9 602-21 690-15 703- 7 704- 9 722-12 809- 5 812-16 841- 3 867- 4 874-13

WIS/NEARSHORE STATION 134, 8 HURDAT STORMS-MAX SURGE 23
 5- 6 117-19 183-15 211-42 232- 9 295- 6 310-47 324- 8 405-33 445-12 565- 7 586-16 602-30 634- 3 690-20 703- 8 704-13 722-21 809- 7 812-29 841- 4 867- 5 874-23

WIS/NEARSHORE STATION 135, 8 HURDAT STORMS-MAX SURGE 22
 5- 5 117-18 183-11 211-36 232- 9 295- 4 310-48 324- 6 405-25 445-10 565- 6 586-10 602-23 690-14 703- 8 704- 9 722-17 809- 7 812-20 841- 4 867- 6 874-16

WIS/NEARSHORE STATION 136, 8 HURDAT STORMS-MAX SURGE 22
 5- 4 117-16 183- 9 211-31 232- 9 295- 4 310-45 324- 6 405-20 445- 8 565- 7 586- 7 602-19 690-10 703- 8 704- 6 722-15 809- 7 812-17 841- 4 867- 6 874-12

WIS/NEARSHORE STATION 137, 8 HURDAT STORMS-MAX SURGE 22
 5- 5 117-24 183-12 211-42 232-11 295- 4 310-62 324- 6 405-27 445-12 565- 7 586-10 602-24 690-13 703- 8 704- 8 722-20 809- 9 812-26 841- 5 867- 9 874-16

WIS/NEARSHORE STATION 138, 8 HURDAT STORMS-MAX SURGE 24
 5- 4 117-21 183-10 211-35 232-11 295- 4 310-53 324- 5 397- 5 405-22 445-10 565-11 586- 9 602-21 690- 9 703- 8 704- 5 722-17 731- 4 809-10 812-22 841- 7 867-10 874-13

WIS/NEARSHORE STATION 139, 8 HURDAT STORMS-MAX SURGE 24
 5- 4 117-18 183- 8 211-30 232-12 295- 3 310-46 324- 5 397-11 405-19 445- 9 565-18 586- 8 602-10 690- 5 703-10 704- 4 722-15 731- 4 809-11 812-19 841- 8 867-11 874-10

WIS/NEARSHORE STATION 140, 8 HURDAT STORMS-MAX SURGE 23
 5- 3 117-14 183- 7 211-25 232-13 310-38 324- 5 397-16 405-16 445- 8 565-23 586- 7 602-10 690- 4 703-12 704- 3 722-13 731- 5 809-12 812-15 841- 8 867-10 874- 8

WIS/NEARSHORE STATION 141, 8 HURDAT STORMS-MAX SURGE 18

117-11 183- 6 211-21 232-15 310-32 324- 3 397-18 405-13 445- 7 565-27 586- 6 703-12 722-11 809-10 812-13
841- 7 867- 9 874- 7

WIS/NEARSHORE STATION 142. # HURDAT STORMS-MAX SURGE 17
117- 9 183- 6 211-17 232-17 310-28 397-20 405-12 445- 6 565-28 586- 5 703-15 722-10 809- 9 812- 9 841- 6
867- 8 874- 6

WIS/NEARSHORE STATION 143. # HURDAT STORMS-MAX SURGE 20
117- 9 183- 6 211-15 232-20 310-24 397-22 405-10 445- 5 565-26 586- 3 703-18 722- 9 731- 5 809- 7 812- 3
832- 5 838- 8 841- 5 867- 7 874- 6

WIS/NEARSHORE STATION 144. # HURDAT STORMS-MAX SURGE 19
117- 9 183- 5 211-14 232-24 310-22 397-25 405-10 565-24 586- 3 639- 3 703-21 722- 8 731-10 809- 7 832-11
838-16 841- 5 867- 6 874- 6

WIS/NEARSHORE STATION 145. # HURDAT STORMS-MAX SURGE 19
117- 9 183- 5 211-13 232-29 310-22 397-21 405-10 565-26 586- 3 639- 5 703-24 722- 8 731-19 809- 7 832-15
838-24 841- 5 867- 6 874- 7

WIS/NEARSHORE STATION 146. # HURDAT STORMS-MAX SURGE 17
117- 7 183- 4 211- 9 232-17 310-16 397-14 405- 6 565-13 703-10 722- 6 731- 8 809- 4 832- 7 838-13 841- 3
867- 4 874- 3

WIS/NEARSHORE STATION 147. # HURDAT STORMS-MAX SURGE 16
117- 6 183- 4 211- 8 232-17 310-15 397-13 565-13 634- 3 639- 3 703-11 722- 5 731-11 809- 3 832- 7 838-14
867- 4

WIS/NEARSHORE STATION 148. # HURDAT STORMS-MAX SURGE 17
117- 6 183- 4 211- 7 232-16 310-13 397-10 565-13 634-10 639- 4 703-11 722- 5 731-15 757- 3 809- 3 832- 7
838-10 867- 4

WIS/NEARSHORE STATION 149. # HURDAT STORMS-MAX SURGE 17
117- 5 183- 3 211- 5 232-15 310-10 397- 6 565-14 634-21 639- 7 703-13 722- 4 731-19 757- 3 809- 3 832- 6
838-18 867- 3

WIS/NEARSHORE STATION 150. # HURDAT STORMS-MAX SURGE 14
117- 5 211- 5 232-14 310- 9 397-10 565- 6 634-13 639- 4 703- 6 722- 3 731-11 757- 3 832- 4 838-10

WIS/NEARSHORE STATION 151. # HURDAT STORMS-MAX SURGE 14
117- 5 211- 5 232-14 310- 9 397-10 565- 6 634-13 639- 4 703- 6 722- 3 731-11 757- 3 832- 4 838-10

WIS/NEARSHORE STATION 152. # HURDAT STORMS-MAX SURGE 13
117- 4 211- 4 232-15 310- 9 397-10 565- 6 634-20 639- 7 703- 7 731-17 757- 5 832- 4 838-11

WIS/NEARSHORE STATION 153. # HURDAT STORMS-MAX SURGE 16
117- 5 211- 4 232-17 241- 4 310-10 324- 4 397-12 565- 6 634-24 639-10 703- 8 731-24 757- 7 775- 4 832- 3
838-13

WIS/NEARSHORE STATION 154. # HURDAT STORMS-MAX SURGE 18
76- 9 117- 4 127- 3 211- 4 232-16 241- 8 310-10 324- 5 397-13 471- 4 565- 5 634-20 639-11 703- 7 731-28
757- 6 775- 8 838-14

WIS/NEARSHORE STATION 155. # HURDAT STORMS-MAX SURGE 17
76-13 117- 3 127- 3 214- 3 232-12 241- 8 324- 5 397- 9 471- 6 565- 5 634-15 639-11 703- 6 731-28 757- 4
775- 8 838-13

WIS/NEARSHORE STATION 156. # HURDAT STORMS-MAX SURGE 15
76-16 127- 5 187- 4 214-14 232- 8 241- 6 324- 5 397- 7 471- 6 562- 4 634- 8 639- 9 731-19 775- 8 838- 8

WIS/NEARSHORE STATION 157. # HURDAT STORMS-MAX SURGE 15

76-14 127- 6 187- 5 214-18 232- 5 241- 4 324- 4 397- 6 471- 4 562- 4 634- 4 639- 8 731-12 775- 5 838- 6

WIS/NEARSHORE STATION 158, 8 HURDAT STORMS-MAX SURGE 12
76-11 127- 7 187- 3 214-16 232- 3 397- 5 562- 4 639- 8 672- 5 731- 8 775- 3 838- 5

WIS/NEARSHORE STATION 159, 8 HURDAT STORMS-MAX SURGE 8
76- 6 127- 5 214-11 397- 4 639- 6 672- 5 731- 6 838- 3

WIS/NEARSHORE STATION 160, 8 HURDAT STORMS-MAX SURGE 8
76- 5 127- 4 214-10 397- 3 639- 4 672- 7 731- 5 838- 3

WIS/NEARSHORE STATION 161, 8 HURDAT STORMS-MAX SURGE 7
76- 4 214- 8 639- 3 672- 9 731- 4 838- 3 859- 3

WIS/NEARSHORE STATION 162, 8 HURDAT STORMS-MAX SURGE 6
76- 3 214- 6 231- 3 276- 3 672-11 731- 3

WIS/NEARSHORE STATION 163, 8 HURDAT STORMS-MAX SURGE 5
214- 4 231- 4 276- 4 461- 3 672-11

WIS/NEARSHORE STATION 164, 8 HURDAT STORMS-MAX SURGE 9
76- 4 214- 5 231- 4 276- 3 461- 4 672-11 731- 3 779- 3 838- 3

WIS/NEARSHORE STATION 165, 8 HURDAT STORMS-MAX SURGE 8
76- 6 214- 7 231- 4 461- 5 672-15 731- 4 779- 4 838- 5

WIS/NEARSHORE STATION 166, 8 HURDAT STORMS-MAX SURGE 17
76-11 127- 6 214-11 215- 3 231- 4 324- 3 397- 4 461- 6 562- 5 598- 5 639- 6 672-22 704- 3 731- 6 779- 5
838- 8 859- 4

WIS/NEARSHORE STATION 167, 8 HURDAT STORMS-MAX SURGE 17
76-20 127-11 214-18 215- 3 231- 5 324- 5 397- 6 461- 7 562- 7 598- 7 639-11 672-33 704- 6 731- 9 779- 5
838-12 859- 7

WIS/NEARSHORE STATION 168, 8 HURDAT STORMS-MAX SURGE 22
76-32 127-18 187- 4 214-29 215- 5 231- 6 324- 6 357- 3 397- 7 461-10 471- 5 562- 7 598-10 634- 5 639-18
672-41 704- 8 731-15 775- 5 779- 6 838-17 859-12

WIS/NEARSHORE STATION 169, 8 HURDAT STORMS-MAX SURGE 26
76-41 127-26 187- 5 214-38 215- 5 231- 5 241- 4 276- 3 324- 6 357- 3 397- 7 461-15 471- 9 562- 7 598-12
634-11 639-24 672-50 703- 6 704-10 731-19 775- 7 779- 5 838-19 839- 3 859-15

WIS/NEARSHORE STATION 170, 8 HURDAT STORMS-MAX SURGE 26
76-30 127-18 187- 3 214-25 215- 9 231- 6 276- 4 324- 5 357- 3 397- 6 461-16 471- 6 490- 3 562- 5 598-12
634- 8 639-16 672-46 703- 4 704- 7 731-13 775- 4 779- 5 838-15 839- 3 859- 9

WIS/NEARSHORE STATION 171, 8 HURDAT STORMS-MAX SURGE 24
76-22 127-12 214-17 215- 9 231- 5 276- 5 324- 4 397- 4 461-16 471- 4 490- 3 562- 4 598- 9 634- 7 639-10
672-35 703- 3 704- 5 731- 9 775- 3 779- 8 833- 4 838-12 859- 6

WIS/NEARSHORE STATION 172, 8 HURDAT STORMS-MAX SURGE 21
76-17 127- 9 214-14 215- 7 231- 5 276- 6 324- 3 397- 4 461-14 490- 4 562- 4 598- 7 634- 6 639- 7 672-26
704- 4 731- 7 779-10 833- 5 838-10 859- 4

WIS/NEARSHORE STATION 173, 8 HURDAT STORMS-MAX SURGE 20
76-14 127- 7 214-11 215- 6 231- 6 276- 7 324- 3 397- 3 461-12 490- 5 562- 4 598- 5 634- 6 639- 6 672-21
731- 6 779-15 833- 5 838-10 859- 3

WIS/NEARSHORE STATION 174, 8 HURDAT STORMS-MAX SURGE 19
76-11 127- 6 214-10 215- 5 227- 4 231- 7 276- 8 324- 3 397- 3 461-10 490- 5 562- 5 598- 4 634- 5 639- 4

672-17 779-18 833- 6 838-10

WIS/NEARSHORE STATION 175, # HURDAT STORMS-MAX SURGE 15
76- 8 127- 5 214- 8 215- 3 227- 6 231- 8 276- 9 461- 8 490- 4 562- 5 634- 4 672-13 779-16 833- 6 838- 8

WIS/NEARSHORE STATION 176, # HURDAT STORMS-MAX SURGE 14
76- 7 127- 4 214- 7 227- 6 231- 8 276- 8 461- 6 490- 3 562- 4 634- 4 672-10 779-12 833- 5 838- 6

WIS/NEARSHORE STATION 177, # HURDAT STORMS-MAX SURGE 21
76-12 127- 7 214-10 215- 4 227-13 231-12 276-17 324- 3 357- 4 397- 3 461- 9 490- 7 562- 6 598- 4 634- 8
639- 4 672-15 779-18 833-10 838-13 839- 3

WIS/NEARSHORE STATION 178, # HURDAT STORMS-MAX SURGE 18
76- 9 127- 5 214- 8 227-10 231-12 276-13 357- 3 461- 6 490- 4 526- 3 562- 6 598- 3 634- 7 672-12 779-13
833- 7 838- 9 839- 3

WIS/NEARSHORE STATION 179, # HURDAT STORMS-MAX SURGE 19
76- 8 127- 5 214- 7 227- 8 231-12 276-10 357- 4 362- 4 461- 5 490- 3 526- 4 562- 6 598- 3 634- 7 672-10
779-11 833- 5 838- 7 839- 3

WIS/NEARSHORE STATION 180, # HURDAT STORMS-MAX SURGE 18
76- 9 127- 5 227- 7 231-14 276- 9 357- 4 362- 6 461- 5 526- 6 562- 7 598- 3 634- 8 672-11 741- 6 779-10
833- 5 838- 7 839- 4

WIS/NEARSHORE STATION 181, # HURDAT STORMS-MAX SURGE 18
76- 9 127- 5 227- 7 231-15 276- 8 357- 4 362- 8 461- 5 526- 8 562- 9 598- 3 634- 9 672-10 741-11 779-10
833- 5 838- 7 839- 4

WIS/NEARSHORE STATION 182, # HURDAT STORMS-MAX SURGE 15
76- 6 227- 4 231- 9 276- 5 357- 4 362- 4 461- 4 526- 4 562- 5 634- 5 672- 8 741- 5 779- 8 838- 4 839- 4

WIS/NEARSHORE STATION 183, # HURDAT STORMS-MAX SURGE 17
76- 7 227- 5 231-10 276- 4 357- 4 362- 6 461- 4 526- 6 562- 7 634- 7 672- 8 712- 4 741- 8 779- 8 833- 3
838- 5 839- 4

WIS/NEARSHORE STATION 184, # HURDAT STORMS-MAX SURGE 17
76- 8 227- 6 231-12 276- 5 296- 3 357- 5 362- 8 461- 4 526- 6 562- 9 634- 9 712- 5 741-11 779- 8 833- 3
838- 6 839- 5

WIS/NEARSHORE STATION 185, # HURDAT STORMS-MAX SURGE 17
76- 6 227- 4 231- 8 276- 4 296- 3 357- 4 362- 5 461- 4 526- 4 562- 5 634- 5 672- 7 712- 5 741- 7 779- 7
838- 4 839- 7

WIS/NEARSHORE STATION 186, # HURDAT STORMS-MAX SURGE 17
76- 7 227- 5 231- 9 276- 5 296- 7 299- 3 357- 5 362- 6 461- 4 526- 5 562- 7 634- 7 712- 8 741-10 779- 7
838- 5 839-10

WIS/NEARSHORE STATION 187, # HURDAT STORMS-MAX SURGE 17
76- 5 227- 3 231- 6 276- 8 296- 6 299- 4 357- 5 362- 6 461- 5 562- 4 634- 4 712- 8 741- 6 779- 7 833- 4
838- 4 839-12

WIS/NEARSHORE STATION 188, # HURDAT STORMS-MAX SURGE 19
76- 7 227- 4 231- 8 276-12 296-11 299- 4 357- 6 362- 9 461- 7 526- 3 562- 6 634- 5 712-13 741- 8 746- 5
779- 8 833- 7 838- 4 839-17

WIS/NEARSHORE STATION 189, # HURDAT STORMS-MAX SURGE 21
76- 7 141- 5 227- 4 231- 9 276-14 296-19 299- 4 357- 6 362-12 461- 9 526- 3 562- 6 634- 5 669- 4 712-16
741- 8 746- 7 779- 9 833-11 838- 5 839-18

WIS/NEARSHORE STATION 190, # HURDAT STORMS-MAX SURGE 20

141- 5 227- 4 231- 9 276-15 296-23 357- 6 362-12 461- 9 526- 3 562- 7 634- 6 643- 4 669- 4 712-15 741- 7
746- 9 779- 9 833-11 838- 5 839-16

WIS/NEARSHORE STATION 191. # HURDAT STORMS-MAX SURGE 19
141- 4 227- 4 231- 9 276-13 296-23 331- 3 357- 6 362-11 461- 7 526- 4 562- 8 634- 6 643- 7 712-14 741- 7
746-10 833- 9 838- 5 839-14

WIS/NEARSHORE STATION 192. # HURDAT STORMS-MAX SURGE 19
141- 7 227- 5 231-13 276-17 296-35 353- 4 357- 6 362-14 461-11 526- 5 562-11 634- 9 643-14 712-20 741-10
746-13 833-13 838- 7 839-20

WIS/NEARSHORE STATION 193. # HURDAT STORMS-MAX SURGE 22
94- 3 141- 6 227- 5 231-13 276-16 289- 5 296-31 331- 5 353-11 357- 6 362-12 461- 7 526- 6 562-12 634- 9
643-15 712-18 741-10 746-14 833- 7 838- 7 839-18

WIS/NEARSHORE STATION 194. # HURDAT STORMS-MAX SURGE 23
94- 4 141- 6 231-13 271- 4 276-11 289- 7 296-28 331-10 353-20 357- 6 362-11 456- 3 463- 3 477- 4 526- 8
562-14 634-11 643-21 712-17 741-10 746-14 833- 6 839-17

WIS/NEARSHORE STATION 195. # HURDAT STORMS-MAX SURGE 22
94- 4 231-14 271- 6 289-11 296-25 331-20 353-38 357- 5 362-11 456- 4 463- 5 477- 5 499- 3 526-11 562-17
634-13 643-32 712-18 741-11 746-19 833- 6 839-18

WIS/NEARSHORE STATION 196. # HURDAT STORMS-MAX SURGE 21
94- 3 231-10 271- 4 289- 7 296-18 331-15 353-33 357- 4 362- 8 456- 4 463- 4 477- 4 526- 7 562-11 634- 8
643-17 712-14 741- 8 746-15 833- 6 839-13

WIS/NEARSHORE STATION 197. # HURDAT STORMS-MAX SURGE 24
94- 3 231-12 271- 6 289-11 296-13 331-26 353-58 357- 5 362- 7 456- 5 463- 8 477- 7 499- 3 526- 9 562-14
634-10 643-27 688- 3 712-14 741- 9 746-22 807- 3 833- 6 839-14

WIS/NEARSHORE STATION 198. # HURDAT STORMS-MAX SURGE 21
94- 4 231- 9 271- 4 289- 6 296- 8 331-18 353-43 357- 5 362- 5 456- 4 463- 7 477- 6 526- 6 562- 9 634- 7
643- 7 712-12 741- 7 746-15 833- 7 839-11

WIS/NEARSHORE STATION 199. # HURDAT STORMS-MAX SURGE 23
94- 7 194- 7 231-10 271- 7 289-11 296- 3 331-31 353-71 357- 5 456- 7 463-13 477-10 526- 8 562-13 634- 9
643- 8 688- 4 712-13 741- 8 746-20 807- 4 833-10 839-13

WIS/NEARSHORE STATION 200. # HURDAT STORMS-MAX SURGE 23
94- 5 194- 7 231- 8 271- 5 289- 7 331-22 353-44 357- 5 456- 6 463-11 477- 7 493- 4 526- 6 562- 9 634- 6
643- 5 688- 4 712-10 741- 6 746-14 807- 3 833- 9 839-10

WIS/NEARSHORE STATION 201. # HURDAT STORMS-MAX SURGE 24
94- 7 194-14 231- 9 271- 8 289-12 331-32 353-43 357- 5 440- 5 456-11 463-21 477-14 493-11 499- 4 526- 8
562-12 634- 8 669- 5 688- 7 712-11 746-18 807- 4 833-11 839-11

WIS/NEARSHORE STATION 202. # HURDAT STORMS-MAX SURGE 23
94- 6 194-13 249- 3 271- 6 289- 8 331-21 353-27 357- 4 440- 4 456- 8 463-17 477-10 493-18 526- 6 562- 9
634- 5 669- 7 688- 6 712- 9 746-13 807- 4 833- 9 839- 9

WIS/NEARSHORE STATION 203. # HURDAT STORMS-MAX SURGE 24
94- 5 194-11 249-10 271- 4 289- 6 299- 6 331-18 353-29 357- 4 397- 4 440- 4 456- 6 463-16 477- 7 493- 3
526- 4 634- 4 669- 8 688- 5 712- 7 746-10 807- 3 833- 8 839- 7

WIS/NEARSHORE STATION 204. # HURDAT STORMS-MAX SURGE 23
94- 5 194-10 249-16 271- 3 289- 5 299-12 331-15 353-32 357- 3 397- 5 440- 6 456- 7 463-17 477- 5 493- 9
634- 3 669-12 688- 4 712- 6 746- 9 807- 5 833- 6 839- 6

WIS/NEARSHORE STATION 205. # HURDAT STORMS-MAX SURGE 21

94- 4 194- 9 249-20 289- 4 299-16 331-13 353-35 357- 4 397- 5 440- 8 456- 8 463-18 477- 6 493-13 669-15
688- 4 712- 6 746- 7 807- 6 833- 4 839- 5

WIS/NEARSHORE STATION 206, # HURDAT STORMS-MAX SURGE 22
94- 4 194- 7 249-23 296- 8 299-18 331-10 353-38 357- 6 397- 3 440- 7 456- 8 463-18 477- 5 493-16 584- 4
643- 3 669-16 688- 4 712- 5 746- 5 807- 6 864- 4

WIS/NEARSHORE STATION 207, # HURDAT STORMS-MAX SURGE 20
94- 3 194- 5 249-24 296- 9 299-22 331- 8 353-32 357- 5 440- 7 456- 7 463-15 477- 4 493- 5 584- 5 669-13
688- 3 712- 4 746- 4 807- 5 864- 5

WIS/NEARSHORE STATION 208, # HURDAT STORMS-MAX SURGE 25
94- 4 141- 5 194-11 249-39 289- 3 292- 3 296- 8 299-33 331-15 353-38 357- 7 397- 3 440- 1 456-12 463-23
477- 7 493- 6 584- 7 643- 5 669-17 688- 4 712- 5 746- 5 807- 8 864- 5

WIS/NEARSHORE STATION 209, # HURDAT STORMS-MAX SURGE 24
94- 3 127- 5 141- 4 194- 8 249-34 296-11 299-30 324- 3 331-10 353-36 357- 6 440-11 456-10 463-19 477- 5
493- 5 584- 8 643- 4 669-12 688- 3 712- 4 746- 4 807- 6 864- 8

WIS/NEARSHORE STATION 210, # HURDAT STORMS-MAX SURGE 21
127- 5 141- 3 194- 8 249-27 276- 5 296-10 299-24 324- 3 331- 8 353-33 357- 4 440-10 456- 8 463-16 477- 4
493- 4 584- 6 669- 8 712- 3 807- 4 864- 6

WIS/NEARSHORE STATION 211, # HURDAT STORMS-MAX SURGE 26
127- 8 141- 5 194-16 249-36 276-10 296-10 299-30 324- 6 331-13 353-45 357- 6 362- 3 440-17 456-13 461- 4
463-22 477- 6 493- 7 584-12 643- 5 662- 4 669-11 688- 3 712- 4 807- 7 864-11

WIS/NEARSHORE STATION 212, # HURDAT STORMS-MAX SURGE 26
127- 7 141- 3 194-15 249-27 276-14 296-11 299-23 324- 4 331-10 353-40 357- 4 362- 4 440-15 456-11 461- 6
463-18 477- 4 493- 5 530- 4 584- 8 643- 4 662- 4 669- 8 712- 3 807- 5 864- 8

WIS/NEARSHORE STATION 213, # HURDAT STORMS-MAX SURGE 24
127- 6 194-13 249-20 276-14 296-11 299-19 324- 4 331- 8 353-35 362- 4 440-12 456- 9 461- 8 463-15 477- 3
493- 3 521- 5 530- 4 584- 6 643- 3 662- 4 669- 3 807- 3 864- 5

WIS/NEARSHORE STATION 214, # HURDAT STORMS-MAX SURGE 27
127- 9 141- 3 194-23 249-26 276-21 296-14 299-22 324- 5 331-12 353-45 357- 4 362- 7 440-20 456-14 461-12
463-18 477- 4 493- 4 521- 5 530- 6 584- 9 597- 5 643- 5 662- 7 669- 4 807- 5 864- 8

WIS/NEARSHORE STATION 215, # HURDAT STORMS-MAX SURGE 24
127- 7 194-20 249-19 276-18 296-16 299-17 324- 4 331- 9 353-42 362- 6 440-16 456-10 461-14 463-15 493- 3
521- 8 530- 4 584- 7 597- 5 643- 4 662- 6 669- 3 807- 3 864- 5

WIS/NEARSHORE STATION 216, # HURDAT STORMS-MAX SURGE 25
127-10 194-33 249-24 276-28 296-21 299-20 324- 5 331-12 353-52 362- 7 440-23 449- 3 456-14 461-18 463-18
493- 5 521-11 530- 8 584-10 597-12 643- 5 662-10 669- 3 807- 5 864- 7

WIS/NEARSHORE STATION 217, # HURDAT STORMS-MAX SURGE 23
127- 7 194-27 249-18 276-21 292- 3 296-19 299-16 324- 3 331- 9 353-45 362- 7 440-17 456-10 461-18 463-14
521-13 530- 5 584- 7 597- 9 643- 4 662- 7 807- 3 864- 4

WIS/NEARSHORE STATION 218, # HURDAT STORMS-MAX SURGE 19
127- 5 194-24 249-13 276-16 292- 4 296-18 299-13 331- 8 353-39 362- 6 440-13 456- 7 461-20 463-10 521-13
530- 3 584- 5 597- 9 662- 5

WIS/NEARSHORE STATION 219, # HURDAT STORMS-MAX SURGE 23
127- 7 194-37 249-17 276-25 292- 5 296-28 299-15 331-10 353-52 362-10 440-17 449- 4 456- 9 461-33 463-12
473- 3 521-19 530- 5 584- 6 597-19 643- 4 662- 7 864- 4

WIS/NEARSHORE STATION 220, # HURDAT STORMS-MAX SURGE 24

127- 5 194-29 249-10 276-20 292- 6 296-19 299-11 331- 9 353-38 357- 8 362- 6 440- 9 449- 4 456- 5 461-27
463- 7 473- 3 521-18 530- 4 584- 6 597-16 639- 6 662- 5 864- 3

WIS/NEARSHORE STATION 221, # HURDAT STORMS-MAX SURGE 24
127- 6 194-37 249-14 276-25 292- 8 296-21 299-12 331-10 353-41 357- 8 362- 7 440-14 449- 5 456- 7 461-32
463- 7 473- 8 521-25 530- 5 584- 6 597-22 635- 4 662- 6 864- 4

WIS/NEARSHORE STATION 222, # HURDAT STORMS-MAX SURGE 24
127- 6 194-37 249-14 276-25 292- 8 296-21 299-12 331-10 353-41 357- 8 362- 7 440-14 449- 5 456- 7 461-32
463- 7 473- 8 521-25 530- 5 584- 6 597-22 635- 4 662- 6 864- 4

WIS/NEARSHORE STATION 223, # HURDAT STORMS-MAX SURGE 25
127- 8 194-43 249-16 276-30 292-10 296-23 299-13 331-12 353-37 357-12 362- 6 440-16 449- 6 456- 8 461-34
463- 7 473-17 521-32 530- 5 584- 7 597-26 635-10 662- 6 797- 5 864- 4

WIS/NEARSHORE STATION 224, # HURDAT STORMS-MAX SURGE 22
127- 6 194-25 276-23 292- 9 296-15 331- 8 353-25 357-16 362- 4 440- 7 449- 4 456- 4 461-23 463- 3 473-11
521-25 530- 4 584- 5 597-16 635- 8 662- 5 864- 3

WIS/NEARSHORE STATION 225, # HURDAT STORMS-MAX SURGE 23
127- 5 194-20 249- 7 276-18 292- 7 296-14 299- 8 331- 8 353-26 357-14 362- 3 440- 6 449- 4 456- 3 461-22
473- 5 521-20 530- 4 584- 5 597-14 635- 4 639- 7 662- 4

WIS/NEARSHORE STATION 226, # HURDAT STORMS-MAX SURGE 20
127- 3 194-15 249- 5 276-13 292- 5 296-15 299- 8 331- 6 353-30 357-12 362- 4 440- 3 456- 3 461-20 463- 3
521-15 584- 5 597-12 635- 6 639-11

WIS/NEARSHORE STATION 227, # HURDAT STORMS-MAX SURGE 18
194-16 249- 5 276- 9 292- 4 296-15 299- 8 331- 5 353-37 357- 9 362- 3 440- 5 461-17 463- 5 521-11 584- 4
597-10 635- 5 639-15

WIS/NEARSHORE STATION 228, # HURDAT STORMS-MAX SURGE 12
194-11 276- 5 292- 3 296- 9 353-21 357-10 461- 7 493- 4 521- 5 597- 8 635- 4 639-15

WIS/NEARSHORE STATION 229, # HURDAT STORMS-MAX SURGE 8
117- 3 189- 5 194-10 299- 3 353- 4 493- 5 635- 3 639- 3

WIS/NEARSHORE STATION 230, # HURDAT STORMS-MAX SURGE 2
112- 5 292- 4

WIS/NEARSHORE STATION 231, # HURDAT STORMS-MAX SURGE 2
112- 4 872- 4

WIS/NEARSHORE STATION 232, # HURDAT STORMS-MAX SURGE 2
112- 3 872- 3

WIS/NEARSHORE STATION 233, # HURDAT STORMS-MAX SURGE 10
189- 7 194- 6 276- 4 292- 3 296- 5 299- 4 353- 9 474- 3 597- 7 639- 3

WIS/NEARSHORE STATION 234, # HURDAT STORMS-MAX SURGE 9
189- 7 194- 5 276- 4 292- 3 296- 5 299- 4 353-11 597- 8 639- 3

WIS/NEARSHORE STATION 235, # HURDAT STORMS-MAX SURGE 9
189- 6 194- 4 276- 5 292- 4 296- 5 299- 3 337- 3 353-13 597- 9

WIS/NEARSHORE STATION 236, # HURDAT STORMS-MAX SURGE 10
189- 7 194- 4 276- 6 292- 4 296- 7 299- 3 353-16 357- 3 597-10 639- 4

WIS/NEARSHORE STATION 237, # HURDAT STORMS-MAX SURGE 10
112- 3 189- 7 194- 4 276- 8 292- 5 296- 9 353-16 357- 4 597-10 639- 7

WIS/NEARSHORE STATION 238, # HURDAT STORMS-MAX SURGE 13
 112- 4 189- 6 194- 3 276- 9 292- 6 296- 7 353-12 357- 4 449- 5 499- 3 597- 7 629- 3 639- 6

WIS/NEARSHORE STATION 239, # HURDAT STORMS-MAX SURGE 13
 112- 4 189- 6 194- 3 276-10 292- 6 296- 7 353-11 357- 5 449- 4 499- 3 597- 6 629- 4 639- 4

WIS/NEARSHORE STATION 240, # HURDAT STORMS-MAX SURGE 12
 112- 4 127- 3 189- 5 194- 3 276-10 292- 7 296- 6 353-10 357- 6 597- 6 629- 5 639- 3

WIS/NEARSHORE STATION 241, # HURDAT STORMS-MAX SURGE 13
 112- 4 127- 3 189- 4 194- 3 276-10 292- 7 296- 5 331- 3 353- 9 357- 6 473- 3 597- 6 629- 5

WIS/NEARSHORE STATION 242, # HURDAT STORMS-MAX SURGE 13
 112- 4 127- 4 189- 3 276- 9 292- 8 296- 5 331- 4 353- 8 357- 6 461- 5 473- 4 597- 5 629- 4

WIS/NEARSHORE STATION 243, # HURDAT STORMS-MAX SURGE 13
 112- 4 127- 4 276- 8 292-10 296- 5 331- 6 353- 8 357- 6 461- 7 473- 4 477- 4 597- 4 629- 3

WIS/NEARSHORE STATION 244, # HURDAT STORMS-MAX SURGE 13
 112- 5 127- 4 276- 7 292-11 296- 4 331- 8 353- 7 357- 6 461- 4 473- 5 477- 6 635- 3 777- 4

WIS/NEARSHORE STATION 245, # HURDAT STORMS-MAX SURGE 13
 112- 5 127- 3 276- 6 289- 4 292-11 296- 4 331- 8 353- 6 357- 5 461- 3 473- 5 477- 5 777- 5

WIS/NEARSHORE STATION 246, # HURDAT STORMS-MAX SURGE 12
 112- 5 271- 4 276- 5 289- 3 292-11 296- 3 331- 7 353- 6 357- 4 473- 5 477- 3 777- 4

WIS/NEARSHORE STATION 247, # HURDAT STORMS-MAX SURGE 10
 112- 6 271- 3 276- 5 292- 9 331- 6 353- 5 357- 4 473- 5 662- 3 777- 3

WIS/NEARSHORE STATION 248, # HURDAT STORMS-MAX SURGE 8
 112- 6 276- 4 292- 7 331- 5 353- 5 357- 3 473- 4 662- 4

WIS/NEARSHORE STATION 249, # HURDAT STORMS-MAX SURGE 16
 112- 8 127- 3 194- 4 271- 5 276- 6 289- 5 292-11 296- 4 331- 9 353- 7 357- 5 473- 5 530- 3 629- 4 662- 5
 777- 6

WIS/NEARSHORE STATION 250, # HURDAT STORMS-MAX SURGE 15
 112- 8 127- 3 194- 4 271- 5 276- 5 289- 4 292- 8 296- 4 331- 7 353- 7 357- 4 473- 4 629- 3 662- 3 777- 5

WIS/NEARSHORE STATION 251, # HURDAT STORMS-MAX SURGE 10
 112- 7 194- 3 271- 4 276- 4 289- 3 292- 6 331- 5 353- 6 357- 3 777- 4

WIS/NEARSHORE STATION 252, # HURDAT STORMS-MAX SURGE 9
 112- 6 194- 3 249- 4 271- 3 276- 4 292- 5 331- 4 353- 4 777- 3

WIS/NEARSHORE STATION 253, # HURDAT STORMS-MAX SURGE 11
 112- 5 194- 4 249- 6 271- 5 276- 3 289- 4 331- 5 353- 4 493- 3 777- 6 872- 3

WIS/NEARSHORE STATION 254, # HURDAT STORMS-MAX SURGE 18
 72- 3 112- 4 194- 8 249-13 271-10 289- 6 292- 5 299- 8 331- 9 353- 6 440- 5 477- 5 493- 8 597- 3 629- 4
 662- 3 777-10 872- 3

WIS/NEARSHORE STATION 255, # HURDAT STORMS-MAX SURGE 26
 72- 6 112- 7 127- 5 194-15 249-19 271-19 289-10 292- 8 299-12 324- 3 331-15 353- 7 397- 6 440- 8 449- 4
 456- 3 465- 3 477- 8 493-14 499- 5 597-10 629- 8 662- 5 669- 4 777-17 872- 4

WIS/NEARSHORE STATION 256, # HURDAT STORMS-MAX SURGE 27
 72- 6 112- 6 127- 4 194-14 249-15 271-16 289- 8 292- 7 299-13 331-10 353- 8 397- 7 440- 8 449- 4 456- 3

463- 3 465- 3 477- 7 493-13 499- 5 597-11 629- 7 662- 4 669-10 711- 3 777-15 872- 4

WIS/NEARSHORE STATION 257, # HURDAT STORMS-MAX SURGE 25

72- 6 112- 5 194-14 249-11 271-13 289- 7 292- 7 299-12 331- 8 353- 8 397- 7 440- 9 449- 5 456- 4 463- 4
477- 7 493-13 499- 5 597- 9 629- 6 662- 4 669-13 711- 3 777-13 872- 4

WIS/NEARSHORE STATION 258, # HURDAT STORMS-MAX SURGE 28

72- 7 112- 5 194-22 249-12 271-18 289- 9 292- 9 299-16 324- 3 331-11 353-12 397-10 440-15 449- 8 456- 6
463- 8 477- 7 493-20 499- 7 521- 3 597- 7 629- 8 662- 6 669-21 711- 4 777-16 807- 5 872- 4

WIS/NEARSHORE STATION 259, # HURDAT STORMS-MAX SURGE 28

72- 7 112- 4 194-24 249-10 271-16 289- 8 292- 8 299-13 331-10 353-14 397- 8 440-16 449- 9 456- 8 463-10
477- 6 493-19 499- 8 521- 3 597- 6 629- 6 662- 6 669-22 711- 4 777-16 797- 3 807- 5 872- 3

WIS/NEARSHORE STATION 260, # HURDAT STORMS-MAX SURGE 28

72- 8 112- 4 194-28 249- 8 271-15 289- 8 292-12 299-12 331- 4 353-18 397- 8 440-18 449-11 456-10 463-13
477- 6 493-19 499- 8 521- 3 597- 6 629- 6 662- 5 669-21 711- 5 777-17 797- 3 807- 6 872- 3

WIS/NEARSHORE STATION 261, # HURDAT STORMS-MAX SURGE 31

72- 9 112- 4 194-37 249- 8 271-16 289- 9 292-20 299-12 331- 5 353-24 397- 7 440-22 449-14 456-13 463-20
465- 4 477- 7 493-21 499-10 521- 3 589- 3 597- 5 629- 8 662- 8 669-21 711- 8 746- 5 777-21 797- 4 807- 6
872- 3

WIS/NEARSHORE STATION 262, # HURDAT STORMS-MAX SURGE 30

72- 9 112- 3 194-28 249- 6 271-11 289- 6 292-16 299- 9 331- 4 353-19 397- 5 440-17 449-12 456-10 463-16
465- 6 477- 5 493-13 499- 7 521- 4 597- 4 629- 6 643- 3 662- 6 669-16 711-10 746- 6 777-22 797- 4 807- 6

WIS/NEARSHORE STATION 263, # HURDAT STORMS-MAX SURGE 35

72-13 103- 4 112- 4 194-38 249- 6 271-13 289- 7 292-22 299-10 331- 5 353-25 397- 5 440-22 449-15 456-13
463-21 465-10 477- 7 493-16 499- 8 521- 7 526- 4 589- 4 597- 4 623- 3 629- 7 643- 6 662- 7 669-17 711-15
746- 7 777-31 797- 5 807- 5 872- 4

WIS/NEARSHORE STATION 264, # HURDAT STORMS-MAX SURGE 36

72- 8 103- 5 112- 4 194-33 196- 4 249- 4 271- 9 292-17 299- 8 353-21 398- 5 440-19 449-12 456-10 463-17
465-13 477- 4 493-11 499- 6 521- 9 526- 7 541- 3 589- 5 597- 3 623- 4 629- 7 630- 3 643- 5 662- 5 669-13
711-12 746- 7 777-26 797- 4 807- 5 872- 5

WIS/NEARSHORE STATION 265, # HURDAT STORMS-MAX SURGE 35

72- 6 103- 6 112- 3 194-29 196- 6 271- 7 292-15 296- 4 299- 7 353-19 398- 9 440-15 449-11 456- 8 463-15
465-15 493- 8 499- 4 521-10 526- 9 541- 5 589- 9 597- 4 623- 4 629- 6 643- 5 662- 3 669-10 711-10 746- 6
777-21 797- 4 807- 4 839- 3 872- 6

WIS/NEARSHORE STATION 266, # HURDAT STORMS-MAX SURGE 35

72- 4 103- 5 194-27 196-11 271- 6 292-14 296- 5 299- 6 353-18 398-13 440-12 449-10 456- 7 463-13 465-17
493- 7 499- 3 521-12 526-11 541- 6 562- 4 589-17 597- 4 623- 4 629- 4 630- 3 643- 6 669- 8 711- 8 746- 5
777-16 797- 4 807- 3 839- 5 872- 6

WIS/NEARSHORE STATION 267, # HURDAT STORMS-MAX SURGE 33

72- 3 103- 4 112- 3 194-31 196-13 292-17 296- 8 299- 6 353-22 398-20 440-13 449-11 456- 7 463-13 465-19
493- 6 521-12 526-15 541- 6 562- 6 589-32 597- 4 623- 4 629- 4 630- 3 643- 7 669- 8 711- 7 746- 5 777-17
797- 5 839- 8 872- 8

WIS/NEARSHORE STATION 268, # HURDAT STORMS-MAX SURGE 28

112- 3 194-23 196- 9 217- 6 292-10 296- 5 299- 5 353-14 398-17 440- 7 449- 6 456- 4 463- 7 465-15 521- 7
526-13 541- 6 552- 4 562- 4 589-19 597- 5 643- 4 669- 9 711-11 797- 4 835- 4 839- 5 872-25

WIS/NEARSHORE STATION 269, # HURDAT STORMS-MAX SURGE 24

194-18 196- 5 217-10 292- 6 296- 3 299- 6 353- 9 398-11 440- 4 463- 4 465-11 521- 4 526- 9 541-20 552- 4
589- 9 597- 7 669- 8 777- 6 797- 4 807- 4 820- 6 835- 5 872-29

WIS/NEARSHORE STATION 270, # HURDAT STORMS-MAX SURGE 31
 194-30 196- 7 217-16 292-12 296- 5 299- 8 353-15 398-14 432- 3 436- 3 440- 6 449- 4 463- 6 465-14 521- 6
 526-12 541-25 552- 5 562- 5 589-14 597-10 643- 5 669-11 746- 3 777- 9 797- 7 807- 4 820- 9 835- 6 839- 6
 872-45

WIS/NEARSHORE STATION 271, # HURDAT STORMS-MAX SURGE 31
 194-28 196- 5 217-12 292-15 296- 7 299- 6 353-16 398-10 432- 4 436- 3 440- 6 449- 4 463- 6 465-11 521- 5
 526-12 541-33 552- 3 562- 7 589-11 597-10 643- 5 669- 9 712- 3 777- 8 797- 7 807- 5 820-10 835- 5 839- 8
 872-38

WIS/NEARSHORE STATION 272, # HURDAT STORMS-MAX SURGE 29
 76- 6 194-33 196- 4 217-11 292-25 296- 9 299- 5 353-24 432- 5 440- 9 449- 4 456- 3 463- 8 465- 9 521- 4
 526-12 541-44 562-13 589-13 597- 6 643- 6 669- 7 712- 8 777- 9 797-10 807- 5 835- 4 839-15 872-36

WIS/NEARSHORE STATION 273, # HURDAT STORMS-MAX SURGE 29
 194-22 217- 5 292-13 296- 4 299- 6 353-11 432- 8 436- 4 440- 4 463- 3 465- 7 526- 9 541-39 545- 3 546- 5
 552- 3 562- 5 589- 7 597-18 643- 4 669- 8 712- 3 777- 4 797- 7 807- 6 820-16 835- 5 839- 8 872-19

WIS/NEARSHORE STATION 274, # HURDAT STORMS-MAX SURGE 28
 194-24 217- 5 292-11 296- 3 299- 7 353-11 357- 3 432- 8 436- 5 465- 7 526-10 541-40 545- 8 546-12 552- 6
 562- 4 589- 7 597-30 643- 6 669- 9 702- 5 777- 4 797- 6 807- 8 820-24 835- 8 839- 6 872-19

WIS/NEARSHORE STATION 275, # HURDAT STORMS-MAX SURGE 31
 76- 4 194-26 217- 4 292-13 296- 4 299- 6 353-13 432- 8 436- 4 440- 4 463- 3 465- 6 526-10 541-39 545- 9
 546-13 552- 6 575- 4 597-33 611- 3 643- 5 669- 8 702- 6 712- 5 777- 3 797- 7 807- 9 820-20 835- 6 839- 8
 872-16

WIS/NEARSHORE STATION 276, # HURDAT STORMS-MAX SURGE 29
 76- 3 194-20 217- 3 292-10 296- 3 299- 5 353-10 432- 5 436- 4 440- 3 465- 4 526- 9 541-30 545- 9 546- 9
 552- 8 575- 3 597-28 611- 3 643- 4 669- 7 702- 6 712- 4 797- 6 807- 6 820-11 835- 6 839- 7 872-12

WIS/NEARSHORE STATION 277, # HURDAT STORMS-MAX SURGE 24
 194-16 292- 8 299- 4 353- 9 432- 4 436- 3 465- 3 526- 8 541-24 545- 8 546- 7 552-10 597-24 611- 3 643- 4
 669- 7 702- 6 712- 3 797- 5 807- 5 820- 5 835- 5 839- 7 872- 9

WIS/NEARSHORE STATION 278, # HURDAT STORMS-MAX SURGE 23
 76- 4 194-17 292- 7 299- 4 353-11 432- 3 436- 3 526- 8 541-22 545- 9 546- 6 552-13 597-31 611- 4 643- 3
 669- 6 702- 9 712- 4 797- 6 807- 7 820- 4 835- 4 839- 8

WIS/NEARSHORE STATION 279, # HURDAT STORMS-MAX SURGE 18
 194-13 292- 4 299- 4 332- 9 353- 6 436- 5 526- 6 541-12 545-10 546- 4 552-18 597-20 611- 4 669- 5 702- 8
 807- 4 835- 7 839- 6

WIS/NEARSHORE STATION 280, # HURDAT STORMS-MAX SURGE 20
 194-16 292- 4 299- 5 332-16 353- 6 386- 3 436- 7 520- 4 526- 6 541- 9 545-13 552-23 597-19 611- 5 635- 4
 669- 5 702-10 807- 4 835-13 839- 4

WIS/NEARSHORE STATION 281, # HURDAT STORMS-MAX SURGE 17
 194-10 299- 4 332-13 353- 4 386- 3 436- 9 520- 4 526- 4 541- 5 545- 8 552-14 597-10 611- 3 669- 5 702- 5
 835-13 839- 3

WIS/NEARSHORE STATION 282, # HURDAT STORMS-MAX SURGE 16
 76- 3 112- 4 194- 9 332-12 353- 4 436-10 520- 3 535- 3 541- 4 545- 9 552-10 597- 7 611- 4 669- 4 702- 4
 835-15

WIS/NEARSHORE STATION 283, # HURDAT STORMS-MAX SURGE 9
 112- 5 194- 5 327- 3 332- 6 436- 8 535- 4 545- 5 552- 4 835-10

WIS/NEARSHORE STATION 284, # HURDAT STORMS-MAX SURGE 10
 194- 5 327- 5 332- 6 370- 5 386- 3 436- 8 545- 4 552- 3 611- 3 835-12

WIS/NEARSHORE STATION # HURDAT STORMS-MAX SURGE 13
 112- 4 194- 7 327- 10 370- 7 386- 4 436-13 535- 4 545- 7 552- 4 597- 3 611- 3 835-18

WIS/NEARSHORE STATION 286. # HURDAT STORMS-MAX SURGE 13
 194- 7 327-11 332-10 370- 8 386- 4 436-13 535- 5 545- 7 552- 4 597- 4 712- 3 807- 3 835-21

WIS/NEARSHORE STATION 287. # HURDAT STORMS-MAX SURGE 13
 194- 6 327-12 332-11 370- 9 386- 4 436-14 535- 3 545- 8 552- 5 597- 6 712- 4 807- 3 835-22

WIS/NEARSHORE STATION 288. # HURDAT STORMS-MAX SURGE 16
 112- 6 194- 7 327-18 332-18 353- 6 370-13 386- 5 436-20 520- 4 541- 3 545-14 552- 9 597-12 629- 4 712- 6 835-33

WIS/NEARSHORE STATION 289. # HURDAT STORMS-MAX SURGE 20
 112-10 194- 7 327-23 332-20 353-16 370-14 386- 6 436-20 456- 4 520- 3 541- 4 545-19 552-15 562- 5 597-16 629- 4 657- 5 712- 8 775- 4 835-36

WIS/NEARSHORE STATION 290. # HURDAT STORMS-MAX SURGE 20
 112-10 194- 6 327-23 332-18 353-25 370-13 386- 6 436-19 456- 5 463- 4 541- 5 545-20 552-16 562- 6 597-16 629- 4 657- 6 712- 7 775- 3 835-35

WIS/NEARSHORE STATION 291. # HURDAT STORMS-MAX SURGE 22
 112- 8 194- 5 292- 3 327-24 332-15 353-32 370-13 386- 6 436-17 456- 5 463- 5 541- 5 545-21 552-16 562- 6 597-14 629- 4 657- 7 672- 3 702- 5 712- 6 835-33

WIS/NEARSHORE STATION 292. # HURDAT STORMS-MAX SURGE 20
 112- 6 327-16 332-11 353-29 370-11 386- 5 436-15 440- 4 456- 3 463- 5 541- 4 545-16 552-11 562- 5 597-12 657- 6 672-10 702- 6 712- 4 835-29

WIS/NEARSHORE STATION 293. # HURDAT STORMS-MAX SURGE 19
 112- 5 327-17 332-10 353-29 370-10 386- 5 436-14 440- 5 463- 4 541- 6 545-20 552-10 562- 4 597-10 657- 7 672-15 702-10 712- 4 835-28

WIS/NEARSHORE STATION 294. # HURDAT STORMS-MAX SURGE 17
 112- 4 327-11 332- 9 353-20 370-10 386- 5 436-13 440- 4 541- 4 545-14 552- 6 597- 7 657- 8 672-10 702- 8 712- 4 835-26

WIS/NEARSHORE STATION 295. # HURDAT STORMS-MAX SURGE 16
 112- 3 327- 7 332- 8 353-13 370- 8 386- 5 436-13 541- 3 545- 9 552- 4 597- 5 657- 9 672- 4 835-25

WIS/NEARSHORE STATION 296. # HURDAT STORMS-MAX SURGE 17
 112- 3 327- 8 332- 8 353-12 370- 8 386- 6 436-13 440- 3 541- 4 545-11 552- 4 597- 5 657-10 672- 5 702- 7 712- 4 835-28

WIS/NEARSHORE STATION 297. # HURDAT STORMS-MAX SURGE 18
 112- 4 327- 9 332-11 353-13 370-10 386- 8 436-16 440- 4 541- 5 545-13 552- 4 597- 4 657-11 672- 6 702- 9 712- 5 748- 3 835-33

WIS/NEARSHORE STATION 298. # HURDAT STORMS-MAX SURGE 18
 112- 3 327- 9 332-10 353-11 370- 9 386- 7 436-16 440- 4 541- 5 545-13 552- 3 597- 3 657- 9 672- 5 702- 9 712- 5 748- 3 835-32

WIS/NEARSHORE STATION 299. # HURDAT STORMS-MAX SURGE 13
 327- 5 332- 7 353- 6 370- 6 386- 8 436-15 541- 5 545- 7 657- 6 702- 8 712- 5 748- 4 835-29

WIS/NEARSHORE STATION 300. # HURDAT STORMS-MAX SURGE 15
 327- 4 332- 7 353- 5 370- 5 386- 9 432- 3 436-16 541- 4 545- 5 597- 3 657- 5 702- 8 712- 6 748- 5 835-31

WIS/NEARSHORE STATION 301, # HURDAT STORMS-MAX SURGE 14
 327- 4 332- 7 353- 4 370- 6 386-12 436-18 541- 4 545- 4 597- 5 657- 5 702- 7 712- 8 748- 6 835-32

WIS/NEARSHORE STATION 302, # HURDAT STORMS-MAX SURGE 15
 327- 4 332- 8 353- 5 370- 6 386-17 432- 3 436-21 541- 5 545- 5 597- 5 657- 6 702- 9 712-12 748- 8 835-42

WIS/NEARSHORE STATION 303, # HURDAT STORMS-MAX SURGE 16
 327- 4 332- 8 353- 5 370- 7 386-20 432- 4 436-23 535- 3 541- 5 545- 5 597- 6 657- 6 702- 7 712-16 748- 9
 835-35

WIS/NEARSHORE STATION 304, # HURDAT STORMS-MAX SURGE 16
 296- 3 327- 4 332- 6 353- 3 370- 5 386-19 436-19 535- 3 541- 5 545- 4 597- 6 657- 5 702- 8 712-14 748- 9
 835-36

WIS/NEARSHORE STATION 305, # HURDAT STORMS-MAX SURGE 16
 296- 6 327- 5 332- 6 353- 4 370- 5 386-18 436-19 535- 4 541- 8 545- 5 597- 6 657- 5 702-14 712-14 748-10
 835-42

WIS/NEARSHORE STATION 306, # HURDAT STORMS-MAX SURGE 15
 296- 4 327- 4 332- 5 353- 4 370- 5 386-24 436-21 535- 4 545- 4 597- 6 657- 5 702-12 712-17 748-12 835-42

WIS/NEARSHORE STATION 307, # HURDAT STORMS-MAX SURGE 12
 332- 5 353- 3 370- 5 386-27 436-20 535- 5 597- 7 657- 5 702- 8 712-16 748-12 835-40

WIS/NEARSHORE STATION 308, # HURDAT STORMS-MAX SURGE 12
 332- 5 353- 3 370- 5 386-29 436-20 535- 5 597- 9 657- 4 702- 5 712-14 748-10 835-34

WIS/NEARSHORE STATION 309, # HURDAT STORMS-MAX SURGE 11
 332- 5 370- 6 386-28 436-19 535- 6 597- 9 657- 4 702- 4 712-12 748- 8 835-27

WIS/NEARSHORE STATION 310, # HURDAT STORMS-MAX SURGE 12
 332- 5 370- 6 386-36 436-22 535-10 597- 9 657- 4 702- 4 712-12 748- 9 805- 3 835-30

WIS/NEARSHORE STATION 311, # HURDAT STORMS-MAX SURGE 11
 332- 5 370- 7 386-28 436-20 535- 7 597- 9 657- 4 702- 3 712- 9 748- 7 835-23

WIS/NEARSHORE STATION 312, # HURDAT STORMS-MAX SURGE 10
 332- 5 370- 7 386-23 436-16 535- 5 597- 7 657- 4 712- 7 748- 5 835-18

WIS/NEARSHORE STATION 313, # HURDAT STORMS-MAX SURGE 11
 332- 6 370- 7 386-23 436-17 440- 3 535- 5 597- 6 712- 7 748- 5 805- 3 835-16

WIS/NEARSHORE STATION 314, # HURDAT STORMS-MAX SURGE 10
 332- 5 370- 7 386-20 436-14 440- 3 535- 4 597- 5 712- 6 748- 4 835-14

WIS/NEARSHORE STATION 315, # HURDAT STORMS-MAX SURGE 11
 332- 5 370- 8 386-24 436-18 440- 4 535- 6 597- 8 643- 3 712- 6 748- 5 835-17

WIS/NEARSHORE STATION 316, # HURDAT STORMS-MAX SURGE 10
 332- 5 370- 9 386-22 436-15 440- 4 535- 6 597- 7 712- 5 748- 4 835-15

WIS/NEARSHORE STATION 317, # HURDAT STORMS-MAX SURGE 13
 332- 5 370-10 386-21 436-13 440- 5 522- 3 535- 5 597- 6 643- 3 712- 5 748- 4 805- 3 835-14

WIS/NEARSHORE STATION 318, # HURDAT STORMS-MAX SURGE 13
 332- 6 370-11 386-17 436-11 440- 5 522- 3 535- 4 597- 5 604- 4 643- 3 712- 4 748- 3 835-11

WIS/NEARSHORE STATION 319, # HURDAT STORMS-MAX SURGE 12
 332- 6 370-11 386-15 436- 9 440- 6 522- 3 535- 4 597- 5 604- 4 606- 3 712- 3 835-10

WIS/NEARSHORE STATION 320, @ HURDAT STORMS-MAX SURGE 7
 332- 8 370- 8 386- 8 436- 5 522- 4 606- 3 835- 5

 WIS/NEARSHORE STATION 321, @ HURDAT STORMS-MAX SURGE 7
 332- 8 370- 8 386- 5 522- 5 604- 4 606- 4 623- 4

 WIS/NEARSHORE STATION 322, @ HURDAT STORMS-MAX SURGE 8
 332- 6 370- 8 386- 4 440- 3 522- 5 604- 3 606- 4 623- 4

 WIS/NEARSHORE STATION 323, @ HURDAT STORMS-MAX SURGE 7
 332- 6 370- 6 386- 4 522- 4 604- 3 606- 4 623- 4

 WIS/NEARSHORE STATION 324, @ HURDAT STORMS-MAX SURGE 8
 332- 5 370- 5 386- 5 436- 4 522- 4 604- 3 606- 4 623- 4

 WIS/NEARSHORE STATION 325, @ HURDAT STORMS-MAX SURGE 8
 332- 6 370- 5 386- 5 436- 4 522- 5 604- 5 606- 4 623- 4

 WIS/NEARSHORE STATION 326, @ HURDAT STORMS-MAX SURGE 9
 332- 5 370- 4 386- 6 436- 6 522- 5 604- 4 606- 4 623- 4 835- 4

 WIS/NEARSHORE STATION 327, @ HURDAT STORMS-MAX SURGE 9
 332- 5 370- 4 386- 6 436- 8 522- 5 604- 4 606- 4 623- 4 835- 5

 WIS/NEARSHORE STATION 328, @ HURDAT STORMS-MAX SURGE 11
 332- 5 370- 4 386- 7 436-10 522- 5 535- 3 597- 4 604- 4 606- 4 623- 4 835- 6

 WIS/NEARSHORE STATION 329, @ HURDAT STORMS-MAX SURGE 11
 332- 5 370- 4 386- 7 436-10 522- 5 535- 4 597- 6 604- 4 606- 4 623- 4 835- 7

 WIS/NEARSHORE STATION 330, @ HURDAT STORMS-MAX SURGE 11
 332- 5 370- 4 386- 8 436-12 522- 5 535- 5 589- 4 597- 7 604- 4 606- 4 835- 9

 WIS/NEARSHORE STATION 331, @ HURDAT STORMS-MAX SURGE 12
 332- 5 370- 4 386- 7 436-12 522- 5 535- 5 589- 4 597- 9 604- 4 606- 4 623- 5 835-10

 WIS/NEARSHORE STATION 332, @ HURDAT STORMS-MAX SURGE 10
 332- 5 370- 4 386- 5 436- 8 522- 5 535- 3 597- 5 606- 4 623- 5 835- 6

 WIS/NEARSHORE STATION 333, @ HURDAT STORMS-MAX SURGE 10
 332- 4 370- 4 386- 5 436- 9 522- 5 535- 3 597- 5 606- 3 623- 5 835- 7

 WIS/NEARSHORE STATION 334, @ HURDAT STORMS-MAX SURGE 8
 332- 4 370- 3 436- 7 522- 5 597- 4 606- 3 623- 5 835- 5

 WIS/NEARSHORE STATION 335, @ HURDAT STORMS-MAX SURGE 6
 332- 4 436- 8 522- 5 597- 3 623- 5 835- 4

 WIS/NEARSHORE STATION 336, @ HURDAT STORMS-MAX SURGE 7
 332- 4 436-11 522- 6 597- 3 623- 5 676- 4 835- 4

 WIS/NEARSHORE STATION 337, @ HURDAT STORMS-MAX SURGE 6
 332- 4 436- 8 522- 5 623- 5 676- 5 835- 3

 WIS/NEARSHORE STATION 338, @ HURDAT STORMS-MAX SURGE 5
 332- 4 436- 6 522- 6 623- 5 676- 3

 WIS/NEARSHORE STATION 339, @ HURDAT STORMS-MAX SURGE 7
 332- 4 370- 3 436- 8 522- 6 623- 5 676- 4 835- 3

WIS/NEARSHORE STATION 340, # HURDAT STORMS-MAX SURGE 8
 332- 4 370- 4 436-10 522- 6 597- 3 623- 6 676- 4 835- 3

WIS/NEARSHORE STATION 341, # HURDAT STORMS-MAX SURGE 9
 332- 4 370- 4 436-12 522- 6 597- 3 623- 6 676- 5 777- 3 835- 4

WIS/NEARSHORE STATION 342, # HURDAT STORMS-MAX SURGE 8
 332- 4 370- 3 436-11 522- 6 597- 3 623- 5 676- 7 835- 4

WIS/NEARSHORE STATION 343, # HURDAT STORMS-MAX SURGE 7
 332- 4 436-10 522- 6 597- 3 623- 5 676- 8 835- 4

WIS/NEARSHORE STATION 344, # HURDAT STORMS-MAX SURGE 7
 332- 4 436-11 522- 6 597- 4 623- 5 676- 4 835- 4

WIS/NEARSHORE STATION 345, # HURDAT STORMS-MAX SURGE 9
 332- 4 370- 3 436-15 522- 6 597- 4 606- 4 623- 5 676- 4 835- 5

WIS/NEARSHORE STATION 346, # HURDAT STORMS-MAX SURGE 13
 332- 5 370- 4 436-14 477- 4 522- 6 535- 4 597- 7 604- 3 623- 6 676- 4 777- 4 779- 4 835- 8

WIS/NEARSHORE STATION 347, # HURDAT STORMS-MAX SURGE 10
 332- 4 370- 3 386- 6 436-11 522- 5 535- 3 597- 6 606- 4 623- 5 835- 7

WIS/NEARSHORE STATION 348, # HURDAT STORMS-MAX SURGE 10
 332- 4 370- 4 386- 6 436-11 522- 5 535- 4 597- 7 606- 3 623- 5 835- 8

WIS/NEARSHORE STATION 349, # HURDAT STORMS-MAX SURGE 11
 332- 4 370- 4 386- 6 436-10 522- 5 535- 4 597- 7 604- 3 606- 3 623- 5 835- 8

WIS/NEARSHORE STATION 350, # HURDAT STORMS-MAX SURGE 12
 332- 5 370- 4 386- 8 436-12 522- 5 535- 5 589- 4 597- 9 604- 4 606- 4 623- 5 835-10

WIS/NEARSHORE STATION 351, # HURDAT STORMS-MAX SURGE 11
 332- 5 370- 4 386- 8 436-12 522- 5 535- 5 589- 4 597- 8 604- 4 606- 4 835-10

WIS/NEARSHORE STATION 352, # HURDAT STORMS-MAX SURGE 11
 332- 5 370- 4 386- 8 436-12 522- 5 535- 5 589- 3 597- 8 604- 4 606- 4 835- 9

WIS/NEARSHORE STATION 353, # HURDAT STORMS-MAX SURGE 10
 332- 5 370- 4 386- 7 436-12 522- 5 535- 3 597- 5 604- 4 606- 4 835- 6

WIS/NEARSHORE STATION 354, # HURDAT STORMS-MAX SURGE 10
 332- 5 370- 4 386- 9 436-14 522- 5 535- 4 597- 6 604- 4 606- 4 835- 8

WIS/NEARSHORE STATION 355, # HURDAT STORMS-MAX SURGE 8
 332- 5 370- 4 386- 7 436- 8 522- 5 604- 5 606- 4 835- 5

WIS/NEARSHORE STATION 356, # HURDAT STORMS-MAX SURGE 8
 332- 6 370- 5 386- 5 436- 5 522- 5 604- 5 606- 4 623- 4

WIS/NEARSHORE STATION 357, # HURDAT STORMS-MAX SURGE 8
 332- 5 370- 5 386- 4 436- 3 522- 4 604- 3 606- 4 623- 4

WIS/NEARSHORE STATION 358, # HURDAT STORMS-MAX SURGE 7
 332- 6 370- 7 386- 4 522- 4 604- 4 606- 4 623- 4

WIS/NEARSHORE STATION 359, # HURDAT STORMS-MAX SURGE 10
 332- 7 370-10 386- 6 436- 5 440- 5 522- 5 604- 5 606- 4 623- 4 835- 4

WIS/NEARSHORE STATION 360, # HURDAT STORMS-MAX SURGE 11
 332- 8 370-13 386-10 436- 6 440- 5 522- 4 604- 5 606- 4 623- 3 805- 3 835- 6

WIS/NEARSHORE STATION 361, # HURDAT STORMS-MAX SURGE 10
 332- 8 370-13 386- 8 436- 5 440- 5 522- 5 604- 5 606- 4 623- 4 835- 5

WIS/NEARSHORE STATION 362, # HURDAT STORMS-MAX SURGE 15
 332- 6 370-13 386-14 436-14 440- 8 522- 4 535- 6 597- 7 604- 7 606- 4 623- 3 643- 5 712- 4 748- 3 835-12

WIS/NEARSHORE STATION 363, # HURDAT STORMS-MAX SURGE 16
 332- 6 370-12 386-19 436-18 440- 7 522- 4 535- 7 597- 9 604- 7 606- 4 623- 3 643- 7 712- 5 748- 4 805- 4 835-15

WIS/NEARSHORE STATION 364, # HURDAT STORMS-MAX SURGE 15
 332- 5 370- 9 386-31 436-26 440- 5 535-11 546- 4 597-14 604- 4 643- 5 702- 3 712- 8 748- 7 805- 3 835-24

WIS/NEARSHORE STATION 365, # HURDAT STORMS-MAX SURGE 15
 332- 3 370- 6 386-31 436-28 440- 5 477- 4 535-12 546- 4 589- 4 597-14 643- 5 702- 3 712- 7 748- 7 835-25

WIS/NEARSHORE STATION 366, # HURDAT STORMS-MAX SURGE 15
 332- 5 370- 9 386-33 436-29 440- 5 535-12 546- 4 597-14 604- 3 643- 4 702- 4 712- 8 748- 8 805- 3 835-26

WIS/NEARSHORE STATION 367, # HURDAT STORMS-MAX SURGE 15
 332- 6 370- 9 386-30 436-27 440- 4 522- 3 535-10 597-13 604- 3 643- 4 702- 3 712- 9 748- 7 805- 3 835-23

WIS/NEARSHORE STATION 368, # HURDAT STORMS-MAX SURGE 16
 332- 5 370- 8 386-36 436-33 440- 4 522- 3 535-13 546- 3 597-17 604- 3 643- 3 702- 4 712-10 748- 9 805- 3 835-29

WIS/NEARSHORE STATION 369, # HURDAT STORMS-MAX SURGE 10
 332- 5 370- 7 386-29 436-22 535- 8 597-10 712- 9 748- 7 805- 3 835-22

WIS/NEARSHORE STATION 370, # HURDAT STORMS-MAX SURGE 12
 332- 5 353- 3 370- 7 386-34 436-25 535- 9 597-14 702- 4 712-11 748- 8 805- 3 835-27

WIS/NEARSHORE STATION 371, # HURDAT STORMS-MAX SURGE 12
 332- 5 353- 3 370- 7 386-39 436-25 535-11 597-11 702- 5 712-14 748-11 805- 3 835-33

WIS/NEARSHORE STATION 372, # HURDAT STORMS-MAX SURGE 13
 332- 5 353- 3 370- 6 386-43 436-24 535-12 597-10 657- 5 702- 6 712-16 748-13 805- 3 835-39

WIS/NEARSHORE STATION 373, # HURDAT STORMS-MAX SURGE 13
 296- 5 332- 5 353- 4 370- 5 386-43 436-25 535- 6 597- 9 657- 5 702-11 712-22 748-19 835-55

WIS/NEARSHORE STATION 374, # HURDAT STORMS-MAX SURGE 15
 296- 6 327- 4 332- 5 353- 4 370- 5 386-36 436-22 535- 4 545- 4 597- 6 657- 5 702-14 712-23 748-17 835-61

WIS/NEARSHORE STATION 375, # HURDAT STORMS-MAX SURGE 18
 296- 8 327- 5 332- 6 353- 4 370- 6 386-29 436-21 477- 4 535- 4 545- 5 546- 3 597- 6 657- 5 702-20 712-20 748-16 779- 3 835-55

WIS/NEARSHORE STATION 376, # HURDAT STORMS-MAX SURGE 19
 296- 8 327- 5 332- 6 353- 4 370- 5 386-19 432- 3 436-18 477- 4 535- 4 541- 9 545- 5 597- 6 657- 5 702-18 712-14 748-10 779- 3 835-45

WIS/NEARSHORE STATION 377, # HURDAT STORMS-MAX SURGE 17
 296- 4 327- 5 332- 7 353- 4 370- 6 386-18 432- 3 436-21 535- 3 541- 6 545- 5 597- 5 657- 5 702- 9 712-16 748-10 835-39

WIS/NEARSHORE STATION 378, # HURDAT STORMS-MAX SURGE 16

327- 5 332- 8 353- 5 370- 7 386-20 432- 4 436-23 535- 3 541- 6 545- 5 597- 6 657- 6 702- 8 712-16 748- 9
835-35

WIS/NEARSHORE STATION 379, # HURDAT STORMS-MAX SURGE 16
327- 5 332- 9 353- 5 370- 7 386-16 432- 4 436-22 535- 3 541- 5 545- 6 597- 6 657- 6 702-10 712-12 748- 9
835-45

WIS/NEARSHORE STATION 380, # HURDAT STORMS-MAX SURGE 16
296- 3 327- 6 332- 8 353- 5 370- 6 386-12 432- 5 436-19 541- 6 545- 7 597- 4 657- 6 702-11 712- 7 748- 6
835-37

WIS/NEARSHORE STATION 381, # HURDAT STORMS-MAX SURGE 16
327- 5 332- 9 353- 6 370- 7 386-14 432- 4 436-21 541- 6 545- 6 597- 5 657- 6 702-11 712- 9 748- 7 805- 3
835-44

WIS/NEARSHORE STATION 382, # HURDAT STORMS-MAX SURGE 17
296- 5 327- 7 332- 8 353- 6 370- 6 386-12 432- 6 436-17 440- 3 541- 7 545- 8 597- 4 657- 6 702-14 712- 6
748- 5 835-39

WIS/NEARSHORE STATION 383, # HURDAT STORMS-MAX SURGE 16
296- 4 327- 6 332- 8 353- 6 370- 6 386-11 432- 4 436-16 541- 6 545- 8 597- 3 657- 6 702-12 712- 5 748- 4
835-36

WIS/NEARSHORE STATION 384, # HURDAT STORMS-MAX SURGE 17
296- 4 327- 7 332- 8 353- 8 370- 7 386- 8 432- 4 436-13 440- 3 541- 7 545-10 597- 4 657- 8 702-12 712- 5
748- 4 835-32

WIS/NEARSHORE STATION 385, # HURDAT STORMS-MAX SURGE 20
112- 3 289- 3 296- 3 327-10 332-10 353-12 370- 9 386- 8 436-16 440- 5 541- 6 545-14 552- 4 597- 3 657-10
672- 6 702- 9 712- 5 748- 3 835-33

WIS/NEARSHORE STATION 386, # HURDAT STORMS-MAX SURGE 17
112- 4 327- 9 332- 9 353-13 370- 9 386- 6 436-13 440- 4 541- 5 545-13 552- 5 597- 5 657-11 672- 6 702- 8
712- 4 835-29

WIS/NEARSHORE STATION 387, # HURDAT STORMS-MAX SURGE 17
112- 4 327-12 332- 9 353-17 370-10 386- 5 436-13 440- 5 541- 5 545-16 552- 6 597- 6 657-10 672-10 702- 9
712- 4 835-27

WIS/NEARSHORE STATION 388, # HURDAT STORMS-MAX SURGE 18
112- 4 327-10 332-11 353-13 370-10 386- 8 436-17 440- 4 541- 5 545-14 552- 4 597- 4 657-11 672- 6 702-10
712- 6 748- 3 835-34

WIS/NEARSHORE STATION 389, # HURDAT STORMS-MAX SURGE 20
112- 6 296- 4 327-18 332-10 353-25 370-11 386- 5 436-13 440- 7 463- 3 541- 7 545-24 552- 9 562- 4 597- 9
657-11 672-17 702-13 712- 4 835-28

WIS/NEARSHORE STATION 390, # HURDAT STORMS-MAX SURGE 22
112- 6 292- 4 296- 4 327-21 332-11 353-31 370-11 386- 5 436-15 440- 6 456- 3 463- 5 541- 7 545-24 552-11
562- 5 597-11 657- 9 672-17 702-12 712- 4 835-28

WIS/NEARSHORE STATION 391, # HURDAT STORMS-MAX SURGE 24
112- 9 194- 4 292- 5 296- 3 327-29 332-15 353-41 370-12 386- 5 436-16 440- 5 456- 5 463- 6 541- 6 545-27
552-16 562- 7 597-13 629- 5 657-10 672-12 702-10 712- 6 835-31

WIS/NEARSHORE STATION 392, # HURDAT STORMS-MAX SURGE 23
112-10 194- 5 292- 5 327-30 332-16 353-39 370-13 386- 6 436-17 440- 4 456- 6 463- 7 541- 5 545-26 552-18
562- 8 597-13 629- 6 657-10 672- 5 702-10 712- 7 835-33

WIS/NEARSHORE STATION 393, # HURDAT STORMS-MAX SURGE 22

112-13 194- 7 292- 4 327-30 332-21 353-31 370-15 386- 6 436-20 456- 7 463- 5 541- 5 545-27 552-21 562- 7
597-18 629- 6 657- 9 702- 4 712- 9 775- 5 835-38

WIS/NEARSHORE STATION 394, # HURDAT STORMS-MAX SURGE 20

112-12 194- 7 327-25 332-21 353-18 370-15 386- 6 436-20 456- 4 520- 3 541- 5 545-22 552-16 562- 5 597-16
629- 5 657- 5 712- 8 775- 5 835-37

WIS/NEARSHORE STATION 395, # HURDAT STORMS-MAX SURGE 18

112- 8 194- 8 327-23 332-21 353- 7 370-15 386- 6 436-21 520- 4 541- 4 545-18 552-11 597-16 629- 5 657- 3
712- 7 775- 4 835-38

WIS/NEARSHORE STATION 396, # HURDAT STORMS-MAX SURGE 16

112- 5 194- 9 327-21 332-18 370-14 386- 6 436-22 520- 4 535- 3 541- 3 545-14 552- 7 597- 9 629- 5 712- 5
835-33

WIS/NEARSHORE STATION 397, # HURDAT STORMS-MAX SURGE 17

76- 3 112- 5 194-10 327-15 332-17 370-11 386- 5 436-18 520- 4 535- 4 541- 3 545-12 552- 8 597- 8 712- 4
807- 5 835-31

WIS/NEARSHORE STATION 398, # HURDAT STORMS-MAX SURGE 15

112- 7 194-10 327-13 332-14 370-10 386- 5 436-19 535- 3 541- 3 545-10 552- 7 597- 5 611- 4 807- 4 835-27

WIS/NEARSHORE STATION 399, # HURDAT STORMS-MAX SURGE 15

112- 7 194- 9 327- 7 332-12 370- 5 386- 4 436-12 535- 5 541- 3 545- 9 552- 7 597- 5 611- 4 669- 3 835-20

WIS/NEARSHORE STATION 400, # HURDAT STORMS-MAX SURGE 21

76- 5 112- 7 194-11 327- 3 332-16 353- 6 386- 3 436-11 520- 4 535- 6 541- 5 545-12 552-12 597- 8 611- 4
635- 3 669- 4 702- 4 712- 5 797- 3 835-15

WIS/NEARSHORE STATION 401, # HURDAT STORMS-MAX SURGE 23

76- 5 112- 3 194-15 292- 4 299- 4 332-19 353- 7 386- 3 436-12 520- 6 526- 4 541- 7 545-14 552-18 597-13
611- 4 635- 4 669- 4 702- 6 712- 5 797- 3 807- 5 835-18

WIS/NEARSHORE STATION 402, # HURDAT STORMS-MAX SURGE 21

194-17 292- 4 299- 5 332-19 353- 6 386- 4 436-10 520- 5 526- 5 541- 8 545-14 552-22 575- 3 597-17 611- 4
635- 5 669- 5 702- 9 807- 5 835-17 839- 4

WIS/NEARSHORE STATION 403, # HURDAT STORMS-MAX SURGE 23

194-18 292- 4 299- 5 332-19 353- 8 386- 4 436- 7 520- 5 526- 6 541-11 545-16 546- 4 552-27 597-23 611- 5
623- 3 635- 5 669- 5 702-12 797- 4 807- 5 835-12 839- 4

WIS/NEARSHORE STATION 404, # HURDAT STORMS-MAX SURGE 30

76- 6 194-24 292- 8 296- 3 299- 5 332-10 353-13 386- 3 436- 5 463- 3 520- 3 526- 8 541-19 545-16 546- 6
552-28 562- 3 597-39 611- 5 623- 4 635- 5 643- 4 662- 4 669- 5 702-18 712- 5 797- 8 807-11 835- 6 839- 8

WIS/NEARSHORE STATION 405, # HURDAT STORMS-MAX SURGE 27

76-10 194-27 292-13 296- 5 299- 4 353-20 432- 5 440- 5 456- 4 463- 6 526-10 541-30 545- 9 546- 9 552-15
562- 6 597-55 611- 4 643- 4 662- 6 669- 6 702-15 712- 9 797-13 807-14 835- 3 839-10

WIS/NEARSHORE STATION 406, # HURDAT STORMS-MAX SURGE 33

76-10 194-32 217- 4 292-17 296- 7 299- 5 353-23 432- 7 436- 4 440- 7 456- 5 463- 7 465- 4 526-11 541-40
545-10 546-14 552- 7 562- 7 597-49 611- 4 643- 5 662- 7 669- 7 702-10 712-10 777- 4 797-13 807-14 820-13
835- 5 839-12 872-14

WIS/NEARSHORE STATION 407, # HURDAT STORMS-MAX SURGE 33

76- 8 194-33 217- 5 292-18 296- 6 299- 6 353-20 432- 8 436- 4 440- 6 456- 3 463- 5 465- 5 526-11 541-44
545-10 546-16 552- 5 562- 5 597-46 611- 4 643- 5 662- 6 669- 8 702- 8 712- 8 777- 4 797-11 807-12 820-19
835- 6 839- 9 872-16

WIS/NEARSHORE STATION 408, # HURDAT STORMS-MAX SURGE 32

76- 6 194-34 217- 5 292-19 296- 6 299- 6 353-19 432-10 436- 4 440- 6 463- 5 465- 6 526-11 541-49 545- 8
546-19 562- 3 575- 3 597-37 611- 4 643- 6 662- 5 669- 8 702- 6 712- 9 777- 5 797-10 807-10 820-25 835- 6
839-11 872-18

WIS/NEARSHORE STATION 409, # HURDAT STORMS-MAX SURGE 34

194-31 217- 6 292-15 296- 4 299- 9 332- 3 353-14 357- 3 432-11 436- 6 440- 4 463- 3 465- 8 526-11 541-49
545- 8 546-16 552- 6 562- 6 589- 9 597-34 611- 3 630- 3 643- 7 669-10 702- 5 712- 4 777- 4 797- 7 807- 9
820-17 835- 9 839- 7 872-23

WIS/NEARSHORE STATION 410, # HURDAT STORMS-MAX SURGE 29

76- 5 194-29 217- 7 292-20 296- 6 299- 6 353-17 432-12 436- 3 440- 6 463- 5 465- 7 526-11 541-49 546- 4
562- 9 589- 9 597-16 630- 9 643- 5 669- 7 712- 6 777- 5 797-10 807- 7 820- 7 835- 5 839-12 872-23

WIS/NEARSHORE STATION 411, # HURDAT STORMS-MAX SURGE 30

76-10 194-41 196- 5 217-14 292-33 296-14 299- 6 353-35 432- 5 440-14 449- 6 456- 6 463-13 465-10 521- 5
526-13 541-53 562-19 589-18 597- 5 630- 5 643- 6 669- 8 712-13 777-12 797-13 807- 5 835- 3 839-19 872-44

WIS/NEARSHORE STATION 412, # HURDAT STORMS-MAX SURGE 34

76- 5 194-43 196- 7 217-19 292-24 296-12 299- 8 353-28 398-15 432- 4 436- 3 440-11 449- 6 456- 4 463-10
465-14 521- 6 526-15 541-36 562-13 589-19 597- 9 630- 4 643- 7 662- 3 669-10 712- 7 746- 3 777-13 797-11
807- 5 835- 6 839-14 872-56

WIS/NEARSHORE STATION 413, # HURDAT STORMS-MAX SURGE 35

112- 4 194-42 196-10 217-26 292-17 296- 8 299- 9 353-22 398-21 432- 3 436- 4 440- 9 449- 7 456- 5 463- 9
465-19 521- 9 526-16 541-22 552- 4 562- 8 589-22 597-10 629- 3 630- 8 643- 7 669-13 746- 4 777-14 797-10
807- 5 820- 9 835- 7 839- 8 872-65

WIS/NEARSHORE STATION 414, # HURDAT STORMS-MAX SURGE 33

112- 3 194-37 196- 9 217-21 292-17 296- 8 299- 7 353-21 398-18 440-10 449- 7 456- 5 463- 9 465-16 521- 6
526-16 541-12 552- 4 562- 8 589-20 597- 6 629- 3 630- 7 643- 6 669-10 746- 3 777-14 797- 8 807- 4 820- 4
835- 5 839- 9 872-58

WIS/NEARSHORE STATION 415, # HURDAT STORMS-MAX SURGE 31

103- 3 112- 4 194-40 196-12 217- 6 292-19 296-10 299- 6 353-26 398-26 440-15 449-11 456- 8 463-13 465-21
521-11 526-18 541- 6 552- 3 562- 9 589-34 597- 5 623- 4 629- 5 643- 8 669-10 746- 4 777-20 797- 7 839-10
872-36

WIS/NEARSHORE STATION 416, # HURDAT STORMS-MAX SURGE 35

72- 5 94- 4 103- 6 112- 3 194-41 196-16 292-26 296-12 299- 6 353-32 398-26 440-20 449-17 456-11 463-25
465-22 477- 4 493- 8 521-15 526-18 541- 7 562-11 589-45 597- 3 623- 4 629- 7 643-11 669- 8 711- 8 746- 5
777-26 797- 6 807- 4 839-12 872- 9

WIS/NEARSHORE STATION 417, # HURDAT STORMS-MAX SURGE 38

72- 7 94- 3 103-10 112- 3 194-41 196-18 271- 9 292-25 296-10 299- 7 353-32 398-21 440-21 449-18 456-12
463-22 465-25 477- 4 493-10 499- 5 521-18 526-16 541- 5 562- 8 589-17 597- 3 623- 4 629- 8 643-11 662- 4
669-10 711-10 746- 7 777-27 797- 5 807- 4 839- 9 872- 6

WIS/NEARSHORE STATION 418, # HURDAT STORMS-MAX SURGE 37

72-11 94- 4 103-11 112- 3 194-45 196-13 271-10 292-27 296- 9 299- 7 353-35 398-16 440-25 449-19 456-15
463-27 465-25 477- 5 493-12 499- 6 521-16 526-16 541- 4 562- 7 589- 4 623- 4 629-10 643-11 662- 5 669-12
711-12 746- 9 777-36 797- 6 807- 5 839- 8 872- 6

WIS/NEARSHORE STATION 419, # HURDAT STORMS-MAX SURGE 39

72-16 94- 3 103- 6 112- 4 194-49 196- 4 249- 5 271-13 292-28 296- 6 299- 9 353-33 397- 3 398- 6 440-28
449-19 456-16 463-27 465-20 477- 6 493-15 499- 8 521-11 526-11 562- 5 589- 4 597- 3 623- 4 629-11 643-10
662- 6 669-15 711-15 746-10 777-43 797- 6 807- 6 839- 5 872- 5

WIS/NEARSHORE STATION 420, # HURDAT STORMS-MAX SURGE 37

72-20 103- 4 112- 4 194-54 249- 8 271-18 289- 9 292-34 296- 5 299-11 331- 8 353-38 397- 6 440-30 449-21
456-20 463-32 465-11 477- 9 493-23 499-11 521- 5 526- 7 562- 3 589- 4 597- 4 623- 3 629-10 643- 9 662-10

669-20 711-20 746-10 777-41 797- 7 807- 7 872- 3

WIS/NEARSHORE STATION 421, 0 HURDAT STORMS-MAX SURGE 32

72-15 112- 4 194-47 249- 8 271-18 289- 9 292-28 299-12 331- 6 353-31 397- 7 440-27 449-18 456-17 463-27
465- 6 477- 9 493-23 499-11 521- 4 526- 3 589- 4 597- 5 629-10 643- 6 662-11 669-21 711-15 746- 8 777-30
797- 6 807- 6

WIS/NEARSHORE STATION 422, 0 HURDAT STORMS-MAX SURGE 32

72- 9 112- 5 194-51 249-10 271-22 289-11 292-30 299-13 331- 8 353-35 397- 8 440-29 449-18 456-20 463-29
465- 3 477-10 493-29 499-14 521- 3 589- 3 597- 6 629-11 643- 5 662-12 669-23 711- 8 746- 6 777-21 797- 5
807- 7 872- 3

WIS/NEARSHORE STATION 423, 0 HURDAT STORMS-MAX SURGE 29

72- 8 112- 5 194-43 249-11 271-23 289-11 292-19 299-16 331- 7 353-26 397-10 440-26 449-16 456-15 463-20
477- 9 493-29 499-12 521- 3 589- 3 597- 6 629-10 662- 9 669-26 711- 6 777-20 797- 5 807- 7 872- 3

WIS/NEARSHORE STATION 424, 0 HURDAT STORMS-MAX SURGE 28

72- 7 112- 5 194-34 249-12 271-21 289-10 292-12 299-16 331-13 353-19 397-10 440-21 449-13 456-11 463-14
477- 7 493-26 499-10 521- 3 597- 7 629- 8 662- 7 669-26 711- 5 777-18 797- 4 807- 5 872- 3

WIS/NEARSHORE STATION 425, 0 HURDAT STORMS-MAX SURGE 30

72- 7 112- 6 141- 3 194-29 249-14 271-23 289-11 292-11 299-19 324- 4 331-13 353-15 397-12 440-19 449-11
456- 8 463-10 477- 8 493-26 499-10 521- 3 597- 7 629-10 662- 8 669-25 711- 4 777-18 797- 4 807- 7 872- 4

WIS/NEARSHORE STATION 426, 0 HURDAT STORMS-MAX SURGE 27

72- 6 112- 6 194-24 249-16 271-22 289-11 292-11 299-19 324- 4 331-13 353-13 397-12 440-16 449- 9 456- 7
463- 8 477- 9 493-22 499- 9 597-10 629-10 662- 7 669-18 711- 4 777-17 807- 5 872- 4

WIS/NEARSHORE STATION 427, 0 HURDAT STORMS-MAX SURGE 27

72- 6 112- 7 127- 5 194-21 249-20 271-23 289-11 292-10 299-19 324- 4 331-13 353-10 397-10 440-13 449- 7
456- 5 463- 5 477-10 493-20 499- 8 597-13 629-11 662- 6 669-12 711- 4 777-19 872- 4

WIS/NEARSHORE STATION 428, 0 HURDAT STORMS-MAX SURGE 27

72- 6 112- 7 127- 5 194-18 249-22 271-22 289-11 292- 9 299-15 324- 4 331-17 353- 8 397- 6 440-10 449- 5
456- 4 463- 3 465- 3 477- 9 493-17 499- 7 597-14 629-10 662- 6 669- 5 777-19 872- 4

WIS/NEARSHORE STATION 429, 0 HURDAT STORMS-MAX SURGE 25

72- 4 112- 7 127- 5 194-15 249-19 271-18 276- 6 289-11 292- 8 299- 9 324- 3 331-16 353- 8 397- 3 440- 9
449- 4 456- 4 473- 3 477- 8 493-13 499- 6 597- 6 629- 9 662- 6 777-16

WIS/NEARSHORE STATION 430, 0 HURDAT STORMS-MAX SURGE 17

72- 3 112- 3 127- 3 194- 8 249- 8 271-10 276- 4 289- 7 292- 4 331-10 353- 6 440- 4 477- 4 493- 5 629- 5
562- 4 777-10

WIS/NEARSHORE STATION 431, 0 HURDAT STORMS-MAX SURGE 13

112- 7 127- 3 194- 6 271- 7 276- 5 289- 5 292- 8 331- 8 353- 5 357- 4 629- 4 662- 3 777- 8

WIS/NEARSHORE STATION 432, 0 HURDAT STORMS-MAX SURGE 14

112- 7 127- 4 194- 6 271- 7 276- 6 289- 6 292- 9 296- 4 331-10 353- 8 357- 5 473- 4 629- 4 777- 7

WIS/NEARSHORE STATION 433, 0 HURDAT STORMS-MAX SURGE 20

112- 9 127- 5 194- 7 271- 9 276- 8 289- 9 292-14 296- 6 331-14 353-11 357- 6 440- 3 461- 3 473- 5 477- 4
499- 3 530- 3 629- 7 662- 7 777-11

WIS/NEARSHORE STATION 434, 0 HURDAT STORMS-MAX SURGE 22

112-10 127- 6 194- 8 271- 9 276-10 289-10 292-19 296- 6 324- 4 331-17 353-12 357- 7 440- 3 461- 4 473- 8
477- 6 499- 4 530- 5 629- 8 639- 5 662- 8 777-12

WIS/NEARSHORE STATION 435, 0 HURDAT STORMS-MAX SURGE 20

112- 9 127- 6 194- 7 271- 8 276-10 289- 9 292-21 296- 6 324- 6 331-17 353-11 357- 7 461- 4 473-10 477- 7

499- 3 629- 7 639- 4 662- 4 777-12

WIS/NEARSHORE STATION 436. # HURDAT STORMS-MAX SURGE 18
112- 7 127- 5 194- 5 271- 6 276- 8 289- 7 292-18 296- 5 324- 5 331-14 353- 9 357- 7 461- 4 473- 8 477- 6
629- 5 639- 3 777- 9

WIS/NEARSHORE STATION 437. # HURDAT STORMS-MAX SURGE 16
112- 6 127- 5 194- 4 271- 4 276- 7 289- 5 292-14 296- 4 331-10 353- 8 357- 6 461- 4 473- 7 477- 6 629- 4
777- 6

WIS/NEARSHORE STATION 438. # HURDAT STORMS-MAX SURGE 13
112- 5 127- 4 276- 6 289- 4 292-11 296- 4 331- 8 353- 7 357- 5 461- 3 473- 5 477- 5 777- 5

WIS/NEARSHORE STATION 439. # HURDAT STORMS-MAX SURGE 14
112- 5 127- 4 276- 7 292-11 296- 4 331- 8 353- 7 357- 6 461- 4 473- 5 477- 6 629- 3 635- 3 777- 4

WIS/NEARSHORE STATION 440. # HURDAT STORMS-MAX SURGE 13
112- 4 127- 4 276- 8 292- 9 296- 5 331- 5 353- 8 357- 6 461- 7 473- 4 477- 3 597- 4 629- 4

WIS/NEARSHORE STATION 441. # HURDAT STORMS-MAX SURGE 13
112- 4 127- 4 189- 3 276- 9 292- 8 296- 5 331- 4 353- 9 357- 6 461- 5 473- 4 597- 5 629- 5

WIS/NEARSHORE STATION 442. # HURDAT STORMS-MAX SURGE 12
112- 4 127- 4 189- 4 194- 3 276-10 292- 7 296- 6 353-10 357- 6 473- 3 597- 6 629- 5

WIS/NEARSHORE STATION 443. # HURDAT STORMS-MAX SURGE 16
112- 4 127- 3 189- 6 194- 4 276-13 292- 6 296- 8 353-13 357- 6 362- 3 449- 5 474- 3 499- 4 597- 8 629- 5
639- 5

WIS/NEARSHORE STATION 444. # HURDAT STORMS-MAX SURGE 14
112- 4 189- 8 194- 4 276-12 292- 6 296-11 353-18 357- 5 362- 4 449- 8 474- 4 597-11 629- 3 639- 7

WIS/NEARSHORE STATION 445. # HURDAT STORMS-MAX SURGE 12
112- 4 189- 7 194- 4 276-10 292- 5 296-11 353-18 357- 4 362- 4 449- 5 597-11 639- 8

WIS/NEARSHORE STATION 446. # HURDAT STORMS-MAX SURGE 12
112- 4 189- 9 194- 5 276- 6 292- 5 296-10 353-22 357- 3 362- 4 597-15 639- 7 651- 3

WIS/NEARSHORE STATION 447. # HURDAT STORMS-MAX SURGE 11
112- 3 189- 8 194- 5 276- 5 292- 4 296- 8 299- 4 353-17 357- 3 597-12 639- 5

WIS/NEARSHORE STATION 448. # HURDAT STORMS-MAX SURGE 10
189- 8 194- 6 276- 4 292- 4 296- 6 299- 4 353-15 474- 3 597-11 639- 4

WIS/NEARSHORE STATION 449. # HURDAT STORMS-MAX SURGE 11
117- 3 189- 8 194- 8 276- 4 292- 3 296- 5 299- 4 353-12 474- 4 597- 8 639- 4

WIS/NEARSHORE STATION 450. # HURDAT STORMS-MAX SURGE 12
117- 4 189- 9 194-10 292- 3 296- 3 299- 4 353- 8 473- 5 474- 4 493- 4 597- 6 639- 3

WIS/NEARSHORE STATION 451. # HURDAT STORMS-MAX SURGE 9
117- 3 189- 6 194-11 299- 4 353- 5 473- 3 493- 5 597- 3 639- 3

WIS/NEARSHORE STATION 452. # HURDAT STORMS-MAX SURGE 14
189- 9 194- 9 276- 5 292- 3 296- 8 299- 3 353-16 357- 8 461- 4 473- 6 521- 3 597- 9 639- 7 651- 5

WIS/NEARSHORE STATION 453. # HURDAT STORMS-MAX SURGE 23
127- 6 194-25 276-24 292- 9 296-17 331- 8 353-28 357-16 362- 4 440- 8 449- 4 456- 4 461-23 463- 4 465- 3
473-12 521-25 530- 4 597-17 635- 9 662- 4 797- 3 864- 3

WIS/NEARSHORE STATION 454, 8 HURDAT STORMS-MAX SURGE 16
 189-10 194-17 276-5 296-10 353-21 357-5 461-6 465-4 473-9 474-5 493-4 521-5 597-11 635-4 639-8
 852-5

WIS/NEARSHORE STATION 455, 8 HURDAT STORMS-MAX SURGE 17
 189-10 194-18 276-5 292-3 296-9 353-21 357-8 461-7 465-4 473-11 474-4 521-6 597-12 635-4 639-9
 651-4 852-4

WIS/NEARSHORE STATION 456, 8 HURDAT STORMS-MAX SURGE 15
 189-11 194-12 276-5 292-4 296-11 353-26 357-11 362-3 461-7 473-9 474-4 521-6 597-14 639-11 651-7

WIS/NEARSHORE STATION 457, 8 HURDAT STORMS-MAX SURGE 24
 127-8 194-40 249-16 276-31 292-11 296-19 299-12 331-11 353-33 357-15 362-6 440-15 449-6 456-8 461-32
 463-7 473-18 521-32 530-5 597-25 635-11 662-6 797-5 864-4

WIS/NEARSHORE STATION 458, 8 HURDAT STORMS-MAX SURGE 24
 127-8 194-50 249-19 276-33 292-10 296-28 299-15 331-13 353-50 357-6 362-9 440-19 449-7 456-10 461-38
 463-11 473-17 521-33 530-6 597-31 635-7 662-8 797-4 864-5

WIS/NEARSHORE STATION 459, 8 HURDAT STORMS-MAX SURGE 25
 127-8 194-52 249-20 276-34 292-8 296-35 299-17 331-13 353-60 362-13 440-21 449-6 456-11 461-43 463-13
 473-11 521-31 530-6 597-33 635-4 643-3 662-8 797-4 807-3 864-5

WIS/NEARSHORE STATION 460, 8 HURDAT STORMS-MAX SURGE 26
 127-9 194-51 249-21 276-34 292-5 296-39 299-19 324-3 331-13 353-67 362-14 440-22 449-5 456-12 461-46
 463-16 473-5 493-3 521-28 530-6 597-31 635-3 643-4 662-9 807-4 864-5

WIS/NEARSHORE STATION 461, 8 HURDAT STORMS-MAX SURGE 23
 127-8 194-37 249-19 276-25 292-4 296-25 299-16 324-3 331-11 353-52 362-9 440-19 449-4 456-11 461-27
 463-14 521-19 530-6 597-16 643-4 662-8 807-3 864-4

WIS/NEARSHORE STATION 462, 8 HURDAT STORMS-MAX SURGE 24
 127-9 194-40 249-22 276-29 292-4 296-23 299-18 324-4 331-12 353-53 362-9 440-22 449-4 456-12 461-23
 463-16 493-4 521-18 530-7 597-16 643-5 662-9 807-4 864-6

WIS/NEARSHORE STATION 463, 8 HURDAT STORMS-MAX SURGE 26
 127-12 194-43 249-27 276-32 292-4 296-21 299-21 324-6 331-15 353-56 362-10 440-27 449-5 456-15 461-18
 463-19 493-5 521-13 530-10 584-4 597-17 643-6 662-13 669-3 807-5 864-8

WIS/NEARSHORE STATION 464, 8 HURDAT STORMS-MAX SURGE 27
 127-14 141-4 194-40 249-32 276-33 296-20 299-26 324-7 331-16 353-59 362-11 440-30 449-4 456-18 461-18
 463-22 477-4 493-7 521-9 530-11 584-3 597-14 643-6 662-14 669-4 807-6 864-10

WIS/NEARSHORE STATION 465, 8 HURDAT STORMS-MAX SURGE 28
 127-14 141-5 194-36 249-34 276-27 292-3 296-13 299-27 324-8 331-18 353-53 362-8 440-29 449-4 456-19
 461-11 463-22 477-6 493-5 521-4 530-10 597-10 643-6 662-12 669-4 688-3 807-7 864-11

WIS/NEARSHORE STATION 466, 8 HURDAT STORMS-MAX SURGE 29
 127-14 141-6 194-34 249-38 276-23 289-4 292-3 296-9 299-30 324-9 331-19 353-54 357-6 362-6 440-30
 449-4 456-20 461-4 463-24 477-8 493-5 530-5 597-9 643-8 662-10 669-11 688-3 807-8 864-13

WIS/NEARSHORE STATION 467, 8 HURDAT STORMS-MAX SURGE 25
 127-11 141-5 194-22 249-35 276-18 296-10 299-29 324-7 331-15 353-51 357-6 362-5 440-22 456-16 461-7
 463-22 477-6 493-6 597-5 643-6 662-6 669-10 688-4 807-6 864-11

WIS/NEARSHORE STATION 468, 8 HURDAT STORMS-MAX SURGE 25
 127-9 141-5 194-18 249-39 276-11 296-10 299-32 324-6 331-15 353-48 357-6 362-3 440-19 456-14 461-4
 463-23 477-7 493-7 643-6 662-4 669-12 688-3 712-4 807-7 864-13

WIS/NEARSHORE STATION 469, 8 HURDAT STORMS-MAX SURGE 26

94- 3 127- 8 141- 5 194-13 249-40 276- 7 296-13 299-34 324- 6 331-13 353-45 357- 7 362- 3 440-16 456-13
463-23 477- 6 493- 7 643- 5 662- 3 669-12 688- 4 712- 4 746- 4 807- 7 864-12

WIS/NEARSHORE STATION 470. # HURDAT STORMS-MAX SURGE 25
94- 4 127- 5 141- 6 194-13 249-45 289- 3 292- 3 296-11 299-38 324- 4 331-15 353-42 357- 7 440-16 456-14
463-24 477- 8 493- 6 643- 5 669-13 688- 4 712- 5 746- 4 807- 9 864-11

WIS/NEARSHORE STATION 471. # HURDAT STORMS-MAX SURGE 24
94- 4 141- 6 194-14 249-44 289- 4 292- 4 296- 7 299-37 331-18 353-34 357- 7 397- 4 440-14 456-14 463-25
477- 9 493- 6 643- 5 669-18 688- 4 712- 5 746- 5 807- 9 864- 5

WIS/NEARSHORE STATION 472. # HURDAT STORMS-MAX SURGE 24
94- 5 141- 8 194-13 249-44 289- 4 292- 4 296-10 299-36 331-19 353-50 357- 8 397- 4 440-14 456-15 463-30
477- 9 493-25 643- 7 669-24 688- 5 712- 6 746- 6 807- 9 864- 4

WIS/NEARSHORE STATION 473. # HURDAT STORMS-MAX SURGE 23
94- 5 141- 4 194-10 249-30 289- 4 296- 8 299-25 331-15 353-45 357- 7 397- 4 440-10 456-11 463-24 477- 7
493-21 643- 4 669-21 688- 5 712- 6 746- 6 807- 8 864- 3

WIS/NEARSHORE STATION 474. # HURDAT STORMS-MAX SURGE 22
94- 5 194-14 249-27 271- 3 289- 5 292- 4 299-23 331-19 353-35 357- 4 397- 6 440-11 456-11 463-23 477- 9
493-18 669-20 688- 5 712- 6 746- 8 807- 8 833- 5

WIS/NEARSHORE STATION 475. # HURDAT STORMS-MAX SURGE 24
94- 5 194-17 249-23 271- 5 289- 7 292- 5 299-17 331-22 353-28 357- 3 397- 7 440-10 456-11 463-23 477- 8
493-16 634- 4 669-18 688- 5 712- 6 746-10 807- 8 833- 7 839- 6

WIS/NEARSHORE STATION 476. # HURDAT STORMS-MAX SURGE 26
94- 6 194-23 249-19 271- 8 289-11 292- 7 299-13 331-25 353- 8 397- 8 440-10 449- 3 456-12 463-25 477-11
493-12 499- 3 526- 6 634- 5 669-17 688- 5 712- 7 746-13 807- 6 833- 9 839- 6

WIS/NEARSHORE STATION 477. # HURDAT STORMS-MAX SURGE 25
94- 9 194-28 249- 9 271-11 289-16 292- 6 331-30 397- 4 440-10 449- 3 456-15 463-30 477-16 493-26 499- 5
526- 8 562-12 634- 8 669-15 688- 7 712- 9 746-19 807- 4 833-10 839-10

WIS/NEARSHORE STATION 478. # HURDAT STORMS-MAX SURGE 25
94-11 194-24 231-11 271-13 289-19 292- 5 331-44 353-43 357- 5 440- 8 456-17 463-32 477-22 493-16 499- 6
526-11 562-16 634-11 669- 9 688- 9 712-13 746-24 807- 4 833-13 839-13

WIS/NEARSHORE STATION 479. # HURDAT STORMS-MAX SURGE 23
94- 7 194-12 231-10 271- 8 289-13 331-36 353-72 357- 5 440- 3 456-10 463-12 477-13 499- 4 526- 9 562-14
634- 9 643- 4 688-10 712-13 746-20 807- 4 833-10 839-12

WIS/NEARSHORE STATION 480. # HURDAT STORMS-MAX SURGE 23
94- 8 194- 8 231-11 271- 7 289-12 331-36 353-79 357- 5 456- 8 463-14 477-11 499- 3 526- 9 562-14 634-10
643- 8 688- 6 712-13 741- 9 746-22 807- 4 833-10 839-13

WIS/NEARSHORE STATION 481. # HURDAT STORMS-MAX SURGE 25
94- 4 194- 6 231-12 271- 8 289-13 296- 5 331-33 353-78 357- 5 362- 4 456- 6 463-11 477- 9 499- 3 526-10
562-15 634-11 643-11 688- 5 712-15 741-10 746-25 807- 4 833- 8 839-15

WIS/NEARSHORE STATION 482. # HURDAT STORMS-MAX SURGE 25
94- 3 194- 6 231-13 271- 9 289-15 296-11 331-33 353-77 357- 5 362- 6 456- 6 463-10 477- 8 499- 4 526-12
562-17 634-13 643-34 688- 4 712-15 741-11 746-28 807- 4 833- 6 839-16

WIS/NEARSHORE STATION 483. # HURDAT STORMS-MAX SURGE 24
94- 3 231-15 271- 9 289-16 296-15 331-33 353-71 357- 5 362- 8 456- 6 463- 8 477- 7 499- 4 526-13 562-20
634-15 643-40 688- 3 712-18 741-12 746-29 807- 4 833- 6 839-19

WIS/NEARSHORE STATION 484. # HURDAT STORMS-MAX SURGE 23

94- 4 231-18 271- 9 289-17 296-25 331-27 353-35 357- 5 362-11 456- 5 463- 7 477- 6 499- 4 526-16 562-24
634-20 643-48 688- 3 712-21 741-14 746-25 833- 6 839-24

WIS/NEARSHORE STATION 485, # HURDAT STORMS-MAX SURGE 26

94- 5 141- 8 227- 9 231-22 271- 7 276-18 289-13 296-45 331-11 353-15 357- 7 362-14 461- 4 463- 3 477- 4
499- 4 526-17 562-28 634-23 643-40 688- 3 712-29 741-17 746-19 833- 7 839-33

WIS/NEARSHORE STATION 486, # HURDAT STORMS-MAX SURGE 21

76-14 94- 4 141- 8 227- 7 231-19 276-20 289- 6 296-46 357- 7 362-16 461- 8 526-10 562-20 634-16 643-27
712-27 741-15 746-17 833- 8 838-11 839-28

WIS/NEARSHORE STATION 487, # HURDAT STORMS-MAX SURGE 20

76-12 94- 3 141- 9 227- 6 231-16 276-19 296-45 357- 7 362-16 461-13 526- 6 562-15 634-11 643-19 712-25
741-13 746-15 833-16 838- 9 839-26

WIS/NEARSHORE STATION 488, # HURDAT STORMS-MAX SURGE 19

141- 7 227- 5 231-12 276-17 296-33 357- 7 362-14 461-11 526- 4 562-10 634- 7 643- 9 712-19 741-10 746-12
779-11 833-14 838- 7 839-20

WIS/NEARSHORE STATION 489, # HURDAT STORMS-MAX SURGE 21

76- 9 141- 7 227- 4 231-11 276-17 296-30 357- 7 362-15 461-11 526- 4 562- 9 634- 7 643- 4 669- 3 712-19
741- 9 746-10 779-11 833-14 838- 6 839-20

WIS/NEARSHORE STATION 490, # HURDAT STORMS-MAX SURGE 21

76- 9 141- 7 227- 4 231-10 276-16 296-21 299- 4 357- 7 362-14 461-10 526- 4 562- 8 634- 7 669- 4 712-19
741-10 746- 8 779-11 833-13 838- 6 839-22

WIS/NEARSHORE STATION 491, # HURDAT STORMS-MAX SURGE 20

76- 8 141- 5 227- 5 231-11 276-12 296-13 299- 4 357- 6 362-11 461- 8 526- 4 562- 8 634- 7 712-17 741-10
746- 5 779-10 833- 9 838- 6 839-23

WIS/NEARSHORE STATION 492, # HURDAT STORMS-MAX SURGE 18

76- 7 227- 5 231-10 276- 7 296- 9 299- 4 357- 5 362- 7 461- 6 526- 4 562- 7 634- 7 712-10 741- 9 779- 8
833- 4 838- 5 839-16

WIS/NEARSHORE STATION 493, # HURDAT STORMS-MAX SURGE 17

76- 7 227- 5 231-10 276- 4 296- 9 299- 3 357- 5 362- 7 461- 4 526- 5 562- 8 634- 8 712- 9 741-10 779- 8
838- 5 839-12

WIS/NEARSHORE STATION 494, # HURDAT STORMS-MAX SURGE 18

76- 8 227- 6 231-12 276- 5 296- 6 357- 5 362- 8 461- 4 490- 3 526- 6 562- 9 634- 9 712- 7 741-12 779- 8
833- 4 838- 6 839- 7

WIS/NEARSHORE STATION 495, # HURDAT STORMS-MAX SURGE 18

76- 9 227- 6 231-14 276- 5 296- 4 357- 5 362- 9 461- 5 490- 3 526- 7 562-11 634-11 712- 6 741-13 779- 9
833- 4 838- 7 839- 5

WIS/NEARSHORE STATION 496, # HURDAT STORMS-MAX SURGE 19

76-10 227- 7 231-15 276- 6 357- 5 362-10 461- 5 490- 3 526- 9 562-12 598- 3 634-11 672-10 712- 4 741-12
779-10 833- 4 838- 7 839- 4

WIS/NEARSHORE STATION 497, # HURDAT STORMS-MAX SURGE 19

76- 9 127- 6 227- 7 231-15 276- 7 357- 4 362- 9 461- 5 526- 9 562-11 598- 3 634- 9 672-10 712- 3 741-11
779-10 833- 5 838- 7 839- 4

WIS/NEARSHORE STATION 498, # HURDAT STORMS-MAX SURGE 19

76-10 127- 6 227- 8 231-17 276- 9 357- 4 362-10 461- 5 490- 3 526- 9 562-10 598- 4 634-10 672-11 741-10
779-11 833- 5 838- 8 839- 4

WIS/NEARSHORE STATION 499, # HURDAT STORMS-MAX SURGE 20

76-11 127- 6 227- 9 231-17 276-11 357- 4 362- 8 461- 6 490- 4 526- 7 562- 9 598- 4 634-10 672-12 703- 3
741- 4 779-12 833- 6 838- 9 839- 4

WIS/NEARSHORE STATION 500, # HURDAT STORMS-MAX SURGE 20
76-11 127- 6 214- 9 227-10 231-15 276-13 357- 4 362- 6 461- 6 490- 4 526- 5 562- 7 598- 4 634-10 672-13
741- 3 779-13 833- 7 838-10 839- 4

WIS/NEARSHORE STATION 501, # HURDAT STORMS-MAX SURGE 21
76-11 127- 6 214- 9 215- 3 227-12 231-13 276-15 357- 4 362- 3 461- 7 490- 5 526- 3 562- 6 598- 4 634- 9
639- 3 672-13 779-14 833- 8 838-11 839- 3

WIS/NEARSHORE STATION 502, # HURDAT STORMS-MAX SURGE 21
76-15 127- 8 214-11 215- 4 227-14 231-12 276-20 324- 3 357- 4 397- 3 461-10 490- 8 562- 7 598- 5 634-10
639- 5 672-17 779-20 833-11 838-16 839- 3

WIS/NEARSHORE STATION 503, # HURDAT STORMS-MAX SURGE 21
76-16 127- 8 214-11 215- 5 227- 8 231-11 276-19 324- 4 357- 4 397- 3 461-12 490- 9 562- 7 598- 6 634- 9
639- 5 672-19 779-25 833-13 838-16 839- 3

WIS/NEARSHORE STATION 504, # HURDAT STORMS-MAX SURGE 24
76-18 127- 9 214-13 215- 6 227- 4 231- 9 276-17 324- 4 357- 4 397- 4 461-14 490-12 562- 7 598- 8 634-10
639- 7 672-23 704- 3 741- 3 779-31 833-14 838-17 839- 3 859- 3

WIS/NEARSHORE STATION 505, # HURDAT STORMS-MAX SURGE 22
76-19 127-10 214-13 215- 7 231- 7 276-13 324- 4 357- 3 397- 3 461-14 490-11 562- 5 598- 6 634- 9 639- 7
672-24 704- 3 779-28 833-12 838-15 839- 3 859- 4

WIS/NEARSHORE STATION 506, # HURDAT STORMS-MAX SURGE 24
76-21 127-11 214-15 215- 8 231- 5 276-10 324- 4 357- 3 397- 4 461-15 471- 3 490- 6 562- 4 598- 8 634-10
639- 8 672-27 703- 3 704- 4 731- 7 779-18 833- 9 838-12 859- 4

WIS/NEARSHORE STATION 507, # HURDAT STORMS-MAX SURGE 24
76-24 127-13 214-17 215-10 231- 5 276- 9 324- 4 397- 4 461-18 471- 4 490- 4 562- 4 598-10 634-10 639-10
672-34 703- 4 704- 5 731- 8 775- 3 779-11 833-10 838-12 859- 5

WIS/NEARSHORE STATION 508, # HURDAT STORMS-MAX SURGE 25
76-29 127-17 214-21 215-11 231- 5 276- 8 324- 4 357- 3 397- 5 461-20 471- 5 490- 3 562- 4 598-13 634-10
639-13 672-44 703- 4 704- 5 731-11 775- 4 779- 7 833- 8 838-13 859- 7

WIS/NEARSHORE STATION 509, # HURDAT STORMS-MAX SURGE 27
76-31 127-40 187- 5 214-51 215- 8 231- 4 241- 5 276-12 324- 5 357- 3 397- 6 461-25 471-17 562- 6 598-17
634-28 639-28 672-77 703-12 704-14 731-22 757- 4 775-10 833- 7 838-14 839- 3 859-16

WIS/NEARSHORE STATION 510, # HURDAT STORMS-MAX SURGE 27
76-38 127-46 187- 8 214-76 215- 4 231- 5 241- 7 276- 9 324- 7 397- 9 461-33 471-25 562- 7 598-14 634-27
639-39 672-62 703-13 704-20 731-33 757- 4 775-15 832- 3 833- 4 838-20 839- 4 859-24

WIS/NEARSHORE STATION 511, # HURDAT STORMS-MAX SURGE 24
76-45 127-29 187- 6 214-48 215- 5 231- 7 241- 4 324- 8 357- 4 397-10 461-12 471- 8 562- 9 598-12 634- 7
639-31 672-54 704-13 731-23 775- 7 779- 7 838-24 839- 4 859-21

WIS/NEARSHORE STATION 512, # HURDAT STORMS-MAX SURGE 20
76-22 127-13 187- 4 214-27 215- 4 231- 8 324- 8 357- 3 397- 9 461-11 562-10 598-10 639-15 672-56 704- 9
731-12 779- 8 838-16 839- 3 859-12

WIS/NEARSHORE STATION 513, # HURDAT STORMS-MAX SURGE 25
76-43 117- 4 127-28 187- 6 214-48 215- 5 231- 8 232-10 241- 4 324-10 357- 4 397-11 461- 9 471- 6 562-11
598-13 639-31 672-58 704-13 731-22 775- 6 779- 8 838-25 839- 4 859-23

WIS/NEARSHORE STATION 514, # HURDAT STORMS-MAX SURGE 16

76- 8 127- 4 214-12 231- 4 324- 4 397- 5 461- 5 562- 4 598- 5 639- 5 672-26 704- 4 731- 6 779- 5 838- 6
859- 4

WIS/NEARSHORE STATION 515, # HURDAT STORMS-MAX SURGE 13

76- 6 127- 3 214- 9 231- 3 397- 4 461- 4 598- 3 639- 4 672-17 731- 5 779- 4 838- 4 859- 4

WIS/NEARSHORE STATION 516, # HURDAT STORMS-MAX SURGE 11

76- 5 127- 3 214- 9 397- 3 461- 3 639- 4 672-14 731- 5 779- 3 838- 4 859- 4

WIS/NEARSHORE STATION 517, # HURDAT STORMS-MAX SURGE 9

76- 5 127- 3 214- 9 397- 3 639- 4 672-11 731- 5 838- 4 859- 4

WIS/NEARSHORE STATION 518, # HURDAT STORMS-MAX SURGE 9

76- 7 127- 5 214-11 397- 4 639- 5 672- 9 731- 5 838- 4 859- 4

WIS/NEARSHORE STATION 519, # HURDAT STORMS-MAX SURGE 9

76- 7 127- 5 214-12 397- 4 639- 5 672- 7 731- 6 838- 4 859- 3

WIS/NEARSHORE STATION 520, # HURDAT STORMS-MAX SURGE 14

76-13 127- 8 187- 4 214-18 232- 3 397- 4 461- 3 562- 5 634- 3 639-11 672- 8 731- 8 775- 3 838- 6

WIS/NEARSHORE STATION 521, # HURDAT STORMS-MAX SURGE 17

76-19 127- 7 187- 7 214-26 232- 6 241- 4 397- 5 461- 3 471- 7 562- 4 634- 6 639-17 672- 9 703- 4 731-14
775- 7 838- 9

WIS/NEARSHORE STATION 522, # HURDAT STORMS-MAX SURGE 16

76-25 127- 9 187- 9 214-29 232- 9 241- 7 324- 5 397- 8 471- 9 562- 5 634- 9 639-17 703- 4 731-21 775- 9
838-13

WIS/NEARSHORE STATION 523, # HURDAT STORMS-MAX SURGE 16

76-16 127- 4 187- 4 214-12 232- 9 241- 7 324- 5 397- 7 471- 8 562- 4 634-10 639-11 703- 4 731-23 775- 9
838-10

WIS/NEARSHORE STATION 524, # HURDAT STORMS-MAX SURGE 18

76-10 117- 4 187- 3 211- 4 232-18 241-15 324- 5 397-13 461- 3 471- 6 565- 9 634-25 639-20 703-10 731-46
757- 6 775-12 838-20

WIS/NEARSHORE STATION 525, # HURDAT STORMS-MAX SURGE 18

76- 6 117- 5 211- 4 232-19 241-10 310-11 324- 5 397-14 471- 4 565- 8 634-26 639-14 703- 9 731-35 757- 7
775- 9 832- 3 838-17

WIS/NEARSHORE STATION 526, # HURDAT STORMS-MAX SURGE 15

117- 5 183- 3 211- 5 232-21 241- 5 310-12 397-14 565-12 634-38 639-16 703-13 731-39 757-12 832- 5 838-20

WIS/NEARSHORE STATION 527, # HURDAT STORMS-MAX SURGE 16

117- 5 183- 3 211- 5 232-18 241- 3 310-11 397-10 565-12 634-35 639-13 703-14 722- 4 731-32 757- 8 832- 5
838-18

WIS/NEARSHORE STATION 528, # HURDAT STORMS-MAX SURGE 16

117- 4 211- 5 232-15 310- 9 397- 4 461- 3 565-14 634-31 639-11 703-16 722- 3 731-25 757- 3 809- 3 832- 6
838-18

WIS/NEARSHORE STATION 529, # HURDAT STORMS-MAX SURGE 16

117- 5 183- 4 211- 5 232-19 310-11 565-24 634-31 639- 9 703-25 722- 5 731-25 757-11 809- 6 832-10 838-19
867- 4

WIS/NEARSHORE STATION 530, # HURDAT STORMS-MAX SURGE 19

117- 6 183- 4 211- 8 232-20 310-14 397- 3 565-22 634-15 639- 5 703-17 722- 5 731-20 757- 5 809- 5 832-10
838-18 841- 3 867- 5 874- 4

WIS/NEARSHORE STATION 531, # HURDAT STORMS-MAX SURGE 18
 117- 7 183- 5 211-10 232-24 310-17 397-10 565-24 634- 6 639- 7 703-22 722- 7 731-26 809- 5 832-12 838-11
 841- 4 867- 5 874- 7

WIS/NEARSHORE STATION 532, # HURDAT STORMS-MAX SURGE 19
 117- 8 183- 5 211-11 232-28 310-20 397-13 405-10 565-25 586- 3 639- 6 703-23 722- 7 731-24 809- 6 832-14
 838- 8 841- 4 867- 6 874- 7

WIS/NEARSHORE STATION 533, # HURDAT STORMS-MAX SURGE 20
 117- 9 183- 6 211-14 232-31 310-24 397-23 405-11 565-29 586- 3 639- 5 703-26 722- 9 731-21 809- 7 812- 3
 832-17 838-26 841- 5 867- 7 874- 8

WIS/NEARSHORE STATION 534, # HURDAT STORMS-MAX SURGE 19
 117- 9 183- 5 211-14 232-26 310-23 397-26 405-10 565-27 586- 3 639- 3 703-24 722- 9 731-11 809- 7 832-12
 838-16 841- 5 867- 7 874- 7

WIS/NEARSHORE STATION 535, # HURDAT STORMS-MAX SURGE 20
 117- 9 183- 6 211-17 232-22 310-26 397-26 405-12 445- 6 565-32 586- 5 703-23 722- 9 731- 7 809- 9 812- 3
 832- 5 838- 6 841- 6 867- 8 874- 8

WIS/NEARSHORE STATION 536, # HURDAT STORMS-MAX SURGE 19
 117-11 183- 7 211-21 232-21 310-32 397-29 405-15 445- 8 565-41 586- 6 703-17 722-11 731- 5 809-12 812-14
 832- 3 841- 8 867-10 874- 9

WIS/NEARSHORE STATION 537, # HURDAT STORMS-MAX SURGE 18
 117-15 183- 8 211-26 232-20 310-39 397-34 405-18 445- 9 565-45 586- 8 703-13 722-13 731-10 809-17 812-19
 841-10 867-12 874-11

WIS/NEARSHORE STATION 538, # HURDAT STORMS-MAX SURGE 21
 117-19 183- 9 211-32 232-17 295- 3 310-47 324- 3 397-26 405-21 445-10 565-41 586- 9 703-10 704- 4 722-16
 731- 9 809-20 812-22 841-12 867-15 874-12

WIS/NEARSHORE STATION 539, # HURDAT STORMS-MAX SURGE 25
 5- 4 117-23 183-10 211-36 232-14 295- 4 310-54 324- 5 397-15 405-23 445-11 565-26 586-10 602-22 690- 8
 703- 9 704- 5 722-18 731- 6 809-17 812-24 832- 3 841-13 867-16 874-13

WIS/NEARSHORE STATION 540, # HURDAT STORMS-MAX SURGE 24
 5- 4 117-25 183-11 211-40 232-12 295- 4 310-60 324- 5 397- 5 405-25 445-12 565- 8 586-11 602-23 690-10
 703- 8 704- 7 722-19 731- 5 809-11 812-26 841-10 867-15 874-15

WIS/NEARSHORE STATION 541, # HURDAT STORMS-MAX SURGE 22
 5- 5 117-26 183-13 211-45 232-11 295- 5 310-67 324- 6 405-29 445-13 565- 7 586-12 602-26 690-14 703- 8
 704- 9 722-22 809- 9 812-29 841- 5 867-10 874-18

WIS/NEARSHORE STATION 542, # HURDAT STORMS-MAX SURGE 22
 5- 5 117-25 183-14 211-47 232-11 295- 5 310-66 324- 7 405-31 445-13 565- 7 586-12 602-27 690-17 703- 8
 704-10 722-23 809- 8 812-29 841- 4 867- 8 874-20

WIS/NEARSHORE STATION 543, # HURDAT STORMS-MAX SURGE 22
 5- 5 117-23 183-15 211-47 232-10 295- 5 310-60 324- 7 405-33 445-13 565- 7 586-14 602-29 690-19 703- 8
 704-12 722-23 809- 7 812-29 841- 4 867- 7 874-22

WIS/NEARSHORE STATION 544, # HURDAT STORMS-MAX SURGE 23
 5- 6 117-19 183-16 211-44 232- 9 295- 6 310-48 324- 8 405-36 445-13 565- 7 586-18 602-32 634- 3 690-21
 703- 8 704-14 722-22 809- 7 812-32 841- 4 867- 5 874-25

WIS/NEARSHORE STATION 545, # HURDAT STORMS-MAX SURGE 23
 5- 6 117-15 183-14 211-37 232- 8 295- 6 310-33 324- 7 405-34 445-12 565- 6 586-18 602-31 634- 3 690-21
 703- 8 704-15 722-17 809- 6 812-28 841- 4 867- 4 874-23

WIS/NEARSHORE STATION 546, # HURDAT STORMS-MAX SURGE 22
 5- 6 117-11 183-10 211-28 232- 6 295- 7 310-19 324- 6 405-32 445-12 565- 5 586-14 602-32 690-21 703- 7
 704-16 722-13 809- 5 912-17 841- 3 867- 4 874-12

WIS/NEARSHORE STATION 547, # HURDAT STORMS-MAX SURGE 22
 5- 6 117- 8 183- 7 211-18 218-10 232- 4 295- 7 310-12 324- 6 405-27 445- 9 565- 5 586- 9 602-31 690-20
 703- 7 704-15 722- 9 809- 4 812- 8 867- 3 874- 7

WIS/NEARSHORE STATION 548, # HURDAT STORMS-MAX SURGE 20
 5- 7 117- 6 183- 6 211-13 218-10 295- 7 310- 7 324- 6 405-25 445-10 565- 5 586- 5 602-33 690-21 703- 6
 704-16 722-13 809- 4 812- 5 874- 5

WIS/NEARSHORE STATION 549, # HURDAT STORMS-MAX SURGE 20
 5- 7 117- 4 183- 5 211- 9 218-10 295- 8 310- 5 324- 6 405-20 445-13 565- 4 586- 5 602-36 690-22 703- 5
 704-16 722-10 809- 3 812- 3 874- 3

WIS/NEARSHORE STATION 550, # HURDAT STORMS-MAX SURGE 17
 5- 8 183- 4 211- 6 218-10 295- 9 324- 6 405-15 445-15 565- 4 586- 4 602-39 690-23 703- 5 704-15 722- 6
 783-13 812- 3

WIS/NEARSHORE STATION 551, # HURDAT STORMS-MAX SURGE 16
 5- 8 183- 4 211- 4 218-10 295-10 324- 6 405-11 445-17 565- 4 586- 4 602-42 690-24 703- 5 704-13 722- 5
 783-13

WIS/NEARSHORE STATION 552, # HURDAT STORMS-MAX SURGE 15
 5-11 183- 4 218-11 295-12 324- 5 405- 5 445-21 565- 3 586- 4 602-53 690-29 703- 4 704-14 722- 4 783-14

WIS/NEARSHORE STATION 553, # HURDAT STORMS-MAX SURGE 14
 5-11 183- 3 218-11 295-12 324- 5 405- 4 445-17 565- 3 586- 3 602-48 690-30 703- 4 704-12 783-14

WIS/NEARSHORE STATION 554, # HURDAT STORMS-MAX SURGE 11
 5-12 183- 3 218-12 295-10 324- 5 445-13 602-37 690-33 703- 4 704-10 783-14

WIS/NEARSHORE STATION 555, # HURDAT STORMS-MAX SURGE 10
 5-13 218-12 295- 6 324- 5 445-11 602-25 690-35 703- 4 704- 8 783-15

WIS/NEARSHORE STATION 556, # HURDAT STORMS-MAX SURGE 10
 5-11 218-13 295- 4 324- 5 445- 9 602-16 690-35 703- 4 704- 9 783-15

WIS/NEARSHORE STATION 557, # HURDAT STORMS-MAX SURGE 9
 5- 5 218-14 324- 6 445- 8 602- 8 690-31 703- 4 704- 9 783-16

WIS/NEARSHORE STATION 558, # HURDAT STORMS-MAX SURGE 9
 5- 3 218-16 324- 6 445- 8 602- 4 690-24 703- 4 704- 9 783-16

WIS/NEARSHORE STATION 559, # HURDAT STORMS-MAX SURGE 8
 218-17 324- 6 445- 7 602- 4 690-17 703- 4 704- 8 783-16

WIS/NEARSHORE STATION 560, # HURDAT STORMS-MAX SURGE 9
 218-20 324- 7 445- 7 602- 5 690- 9 703- 4 704- 6 756- 6 783-18

WIS/NEARSHORE STATION 561, # HURDAT STORMS-MAX SURGE 9
 218-22 324- 7 445- 6 602- 4 690- 6 703- 4 704- 5 756- 6 783-19

WIS/NEARSHORE STATION 562, # HURDAT STORMS-MAX SURGE 10
 218-25 324- 8 445- 6 602- 4 690- 5 703- 4 704- 4 756- 6 783-22 813- 3

WIS/NEARSHORE STATION 563, # HURDAT STORMS-MAX SURGE 10
 218-28 324-10 445- 6 602- 5 690- 3 703- 5 739- 3 756- 8 783-29 813- 4

WIS/NEARSHORE STATION 564, # HURDAT STORMS-MAX SURGE 8
 218-20 324-12 445- 5 602- 5 703- 5 756- 8 783-26 813- 3

WIS/NEARSHORE STATION 565, # HURDAT STORMS-MAX SURGE 9
 218-22 324-11 445- 5 602- 5 693- 3 703- 5 756- 8 783-28 813- 4

WIS/NEARSHORE STATION 566, # HURDAT STORMS-MAX SURGE 9
 218-19 324-14 445- 6 602- 5 693- 3 703- 6 756- 9 783-31 813- 4

WIS/NEARSHORE STATION 567, # HURDAT STORMS-MAX SURGE 8
 218- 9 324-16 445- 6 602- 4 703- 7 756- 9 783-33 813- 5

WIS/NEARSHORE STATION 568, # HURDAT STORMS-MAX SURGE 8
 324-12 445- 5 602- 4 703- 7 739- 3 756- 8 783-24 813- 6

WIS/NEARSHORE STATION 569, # HURDAT STORMS-MAX SURGE 8
 324- 9 445- 5 602- 3 703- 7 739- 4 756- 9 783-19 813- 7

WIS/NEARSHORE STATION 570, # HURDAT STORMS-MAX SURGE 6
 324- 6 693- 3 703- 7 739- 6 756- 9 813- 6

WIS/NEARSHORE STATION 571, # HURDAT STORMS-MAX SURGE 6
 324- 5 693- 4 703- 7 739- 6 756-10 813- 4

WIS/NEARSHORE STATION 572, # HURDAT STORMS-MAX SURGE 5
 324- 3 693- 5 703- 7 739- 9 756-11

WIS/NEARSHORE STATION 573, # HURDAT STORMS-MAX SURGE 4
 693- 5 703- 6 739-11 756-12

WIS/NEARSHORE STATION 574, # HURDAT STORMS-MAX SURGE 5
 651- 3 693- 6 703- 6 739-14 756-13

WIS/NEARSHORE STATION 575, # HURDAT STORMS-MAX SURGE 5
 651- 3 693- 6 703- 6 739-16 756-15

WIS/NEARSHORE STATION 576, # HURDAT STORMS-MAX SURGE 5
 651- 3 693- 7 703- 6 739-16 756-18

WIS/NEARSHORE STATION 577, # HURDAT STORMS-MAX SURGE 5
 651- 4 693-10 703- 6 739-14 756-20

WIS/NEARSHORE STATION 578, # HURDAT STORMS-MAX SURGE 2
 112- 7 292- 8

WIS/NEARSHORE STATION 579, # HURDAT STORMS-MAX SURGE 3
 112- 6 292- 3 872- 5

WIS/NEARSHORE STATION 580, # HURDAT STORMS-MAX SURGE 3
 112- 7 292- 3 872- 8

WIS/NEARSHORE STATION 581, # HURDAT STORMS-MAX SURGE 3
 112- 7 292- 7 872- 5

WIS/NEARSHORE STATION 582, # HURDAT STORMS-MAX SURGE 3
 112- 6 299- 5 651- 3

WIS/NEARSHORE STATION 583, # HURDAT STORMS-MAX SURGE 3
 112- 5 299- 6 651- 4

WIS/NEARSHORE STATION 684. 0 HURDAT STORMS-MAX SURGE 5
112- 3 299- 0 651- 7 777- 4 783- 3

WIS/NEARSHORE STATION 685. 0 HURDAT STORMS-MAX SURGE 4
112- 4 299- 4 651- 6 783- 3

WIS/NEARSHORE STATION 686. 0 HURDAT STORMS-MAX SURGE 3
112- 5 299- 5 651- 4

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13. ABSTRACT (Maximum 200 words) This report summarizes results of a numerical storm surge study conducted for the east coast of the United States and the Gulf of Mexico. The report describes a database of surge elevations and currents produced from the numerical simulation of 134 historically based tropical storm events and their maximum water level surge impact at 486 discrete locations along the east and gulf coasts of the United States and Puerto Rico. A visual indication of the spatial distribution of the peak surge elevation is provided in the form of an atlas of storm track and maximum storm surge corresponding to a 246-station nearshore subset of the 486-location database. The simulated events used to generate the results contained in this report are not intended to be hindcasts of historic events. The goal was to provide a database of events similar to historic events which can be used to evaluate project response to, or protection afforded from, events which are realistic in both magnitude and duration for a specific location. If use of the database indicates a more detailed study is necessary, then the modeling techniques described in this report can be used to hindcast specific events. This hindcasting procedure requires detailed verification of the storm event by comparing computed results to prototype data, a procedure which was beyond the scope of this study. (Continued)				
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This database represents one component of a family of databases generated in support of the goals of the Dredging Research Program (DRP) Work Unit No. 32466, "Numerical Simulation Techniques for Evaluating Long-Term Fate and Stability of Dredged Material Disposed in Open Water" of Technical Area 1 of the DRP. The primary goal is to develop a database of site-specific information which can be used to evaluate the fate and stability of open-water dredged material disposal sites. Other databases include tidal elevations and currents for the east and Gulf of Mexico coasts and Caribbean sea and a capability for generating simulated time sequences of wave height, period, and direction for all coasts of the United States.